

ENERGY ASSESSMENT

FOR

ST. CLARE BUSINESS PARK

RICHMOND

VERSION 3.1

Issued by:-

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PROJECT REVISION SHEET

ST. CLARE BUSINESS PARK, SOUTHWARK

170209

Revision V3.1

Date of first issue - 09 October 2019

Prepared by: Andrew Sturt

Revision	Date	Details	Changes	Author	Checked
1.0	09-10-2019	For Planning	-	A Sturt	A Singh
2.0	09-03-2020	For Planning	Strategy revised to incorporate heat pumps	A Sturt	A Singh
2.1	12-03-2020	For Planning	Comments incorporated	A Sturt	A Singh
3.0	15-06-2022	For Planning	Window Areas amended to suit Part O	M Smith	A Sturt
3.1	21-06-2022	For Planning	Minor amendments	M Smith	A Sturt

EXECUTIVE SUMMARY

Silcock Dawson and Partners have been appointed by Notting Hill Home Ownership Ltd to provide an Energy Assessment for the proposed new development at St. Clare Business Park, Richmond. This Energy Assessment is submitted as part of an application for full planning consent.

The aim of this report is to document the findings of the investigation into energy efficiency measures and the feasibility of on-site decentralised and renewable or low carbon energy sources.

Demolition of existing buildings and erection of 1no. mixed use building between three and five storeys plus basement in height, comprising 98no. residential flats (Class C3) and 1,172sq.m of commercial floorspace (Class E); 1no. three storey building comprising 893sq.m of commercial floorspace (Class E); 14no. residential houses (Class C3); and, associated access, external landscaping and car parking. The dwellings occupy the majority of the floor area and will be designed to be energy efficient and incorporate the following key features:

- 1. The annual heating demand will be reduced by using insulation values better than the Notional Building¹, internal walls and floor slabs between the conditioned spaces and unheated internal spaces such as the residential entrance lobbies and refuse stores will be insulated. The target air permeability is 3.0 m³/hr/m².
- 2. The dwellings will have a balanced ventilation system with heat recovery and automatic summer bypass.
- 3. The dwellings will be provided with 100% low energy luminaires.

The commercial units will also be provided with energy efficient LED lighting with daylight compensation controls where appropriate, in addition fabric U values will be better than the Notional Building values.

The London heat map has been consulted, and it is noted that the site is not close to an existing heat network and is over 700m away from the edge of the nearest heat map study area.

The site is within a developed sub urban area with a large number of terraced and semi detached houses. The London heat map identifies the site location within an area of low heat density, it is therefore unlikely that a district heating network will be extended to development.

However, a communal heating system is proposed for the apartments, comprising a roof mounted air source heat pump. The heat pump will be sized to ensure continuous operation and meet 100% of the annual heat demand.

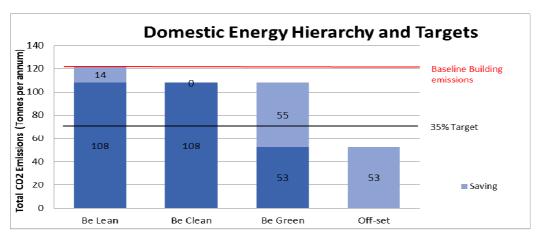
As it is unlikely that a district wide heating system will be implemented, it would be more efficient to serve the houses from individual heat pump systems, because of the higher distribution losses that would be expected from the increased pipework necessary at smaller pipe sizes.

The commercial units will be heated via reverse cycle heat pumps that will also be used to provide comfort cooling.

A large PV array will be mounted on the roof of Block 1, with all power generated directed to the residential landlord supply. The total PV capacity for the development is predicted to be 67.2kWp.

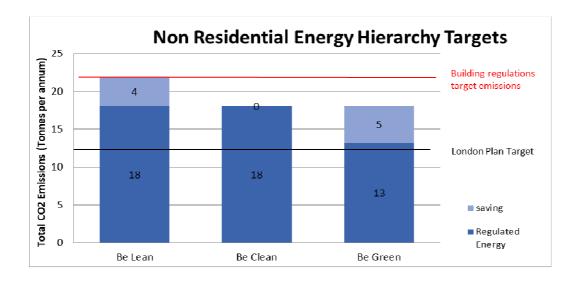
GLA Table 2: Dwelling Carbon Dioxide Emissions from each stage of the Energy Hierarchy				
Regulated Carbon dioxide				
	savings			
	(Tonnes CO2	(%)		
	per annum)	(70)		
Savings from energy demand reduction	14	11		
Savings from CHP	0	0		
Savings from renewable energy	55	45		
Cumulative on site savings 69 57				

¹ Notional building forms the basis of the Target Emission Rate (TER), which is the minimum energy performance requirement for a new building.



The energy efficiency measures reduce the residential emissions by 11%, with a further 36% reduction from the heat pumps serving the dwellings plus a 9% reduction from the photovoltaic panel installations, resulting in a total CO_2 reduction of 45% or 55 tonnes when SAP 10 emission rates are applied.

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy			
	Regulated Carbon dioxide savings		
	(Tonnes CO2 per annum)	(%)	
Savings from energy demand reduction	4	18	
Savings from CHP	0	0	
Savings from renewable energy	5	22	
Total cumulative savings	9	40	



The energy efficiency measures from the commercial units are greater at 18%, with a further 22% reduction from the air source heat pump installations.

The total CO_2 reduction as a result of the energy efficiency measures across the whole development is predicted to be 18 tonnes CO_2 or 12% below the baseline model, with a total emissions reduction of 78 tonnes or 54% once renewable energy measures are incorporated.

Table 6: Carbon Dioxide Emissions from each stage of the Energy Hierarchy				
	Total Regulated CO2 Savings Percentage Sav			
	(Tonnes CO2/year)	(Tonnes CO2/year)	%	
Part L 2013 Baseline	144			
Be Lean	126	18	12	
Be Clean	126	0	0	
Be Green	66	60	42	
Cumulative Saving		78	54	
Total off-set £		188,056		

Following a review of the relevant National and Local Planning Policies, this Energy Assessment proposes a strategy that positively responds to Policy 5.2 of the London Plan 2021, Policy SI2, SI3 of the ft London Plan 2021, and Policy LP22 Sustainable Design and Construction of the London Borough of Richmond upon Thames Local Plan (2017)

The zero carbon homes CO_2 offset payment is calculated to be £188,056 based on £95.00 / tonne over a 30 year period

1 INTRODUCTION

1.1 Background

Silcock Dawson and Partners have been appointed by Notting Hill Home Ownership Ltd to provide an Energy Assessment for the proposed new development at St. Clare Business Park, Richmond. This Energy Assessment is submitted as part of an application for full planning consent.

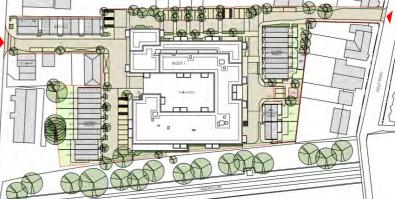
The aim of this report is to document the findings of the investigation into energy efficiency measures and the feasibility of on-site decentralised and renewable or low carbon energy sources.

1.2 Description of the Site and Building

Demolition of existing buildings and erection of 1no. mixed use building between three and five storeys plus basement in height, comprising 98no. residential flats (Class C3) and 1,172sq.m of commercial floorspace (Class E); 1no. three storey building comprising 893sq.m of commercial floorspace (Class E); 14no. residential houses (Class C3); and, associated access, external landscaping and car parking.

The following images detail the ground and typical floor spaces, for a detailed description of the development refer to the Design and Access Statement provided by AHR Architects.





Site layout



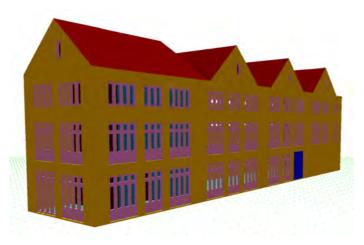
Block 1 Ground floor (Commercial and carpark)



Block 1 First (Typical) Floor



Block 2 First (Typical) Floor



Dynamic Simulation Model Image of Block 2

2 RELEVANT PLANNING POLICIES

This Energy Strategy responds to the broader set of National, and Regional policies outlined below.

2.1 National Planning Policy

The Government has set out a planning policy framework guidance in the National Planning Policy Framework (NPPF 2021), within which planning authorities can prepare and apply their development plans. Fundamental to this guidance is the requirement to meet sustainable development objectives.

The NPPF covers a wide range of planning issues from promoting sustainable transport to facilitating the sustainable use of minerals. Climate change is covered in section 14 'Meeting the challenge of climate change, flooding and coastal change'. In summary the framework advises:

"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

New development should be planned for in ways that:

- avoid increased vulnerability to the range of impacts arising from climate change. When
 new development is brought forward in areas which are vulnerable, care should be
 taken to ensure that risks can be managed through suitable adaptation measures,
 including through the planning of green infrastructure; and
- can help to reduce greenhouse gas emissions, such as through its location, orientation
 and design. Any local requirements for the sustainability of buildings should reflect the
 Government's policy for national technical standards.

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

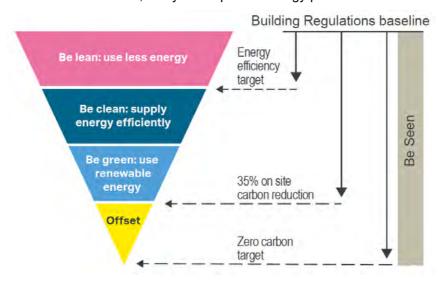
 identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

Refer to: National Planning Policy Framework (2019) for further details.

2.2 Regional Policy – The London Plan (March 2021)

2.2.1 Policy SI 2 Minimising Greenhouse Gas Emissions

- A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:
 - 1. be lean: use less energy and manage demand during operation.
 - 2. be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
 - 3. be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
 - 4. be seen: monitor, verify and report on energy performance.



Source: Greater London Authority

- B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy
- C A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:
 - 1. through a cash in lieu contribution to the borough's carbon offset fund, or
 - 2. off-site provided that an alternative proposal is identified and delivery is certain.

2.2.2 Policy SI 3 Energy Infrastructure

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

- B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:
 - 1. major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
 - heat loads from existing buildings that can be connected to future phases of a heat network
 - 3. major heat supply plant including opportunities to utilise heat from energy from waste plants
 - 4. secondary heat sources, including both environmental and waste heat
 - 5. opportunities for low and ambient temperature heat networks
 - 6. possible land for energy centres and/or energy storage
 - 7. possible heating and cooling network routes
 - 8. opportunities for future proofing utility infrastructure networks to minimise the impact from road works
 - 9. infrastructure and land requirements for electricity and gas supplies
 - 10. implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
 - 11. opportunities to maximise renewable electricity generation and incorporate demand-side response measures.
- C Development Plans should:
 - identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
 - identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.
- D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system
 - 1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
 - a) connect to local existing or planned heat networks
 - b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
 - use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
 - d) use ultra-low NOx gas boilers.

- CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI 1 Improving Air Quality.
- 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.
- E Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE CP1 Heat Networks: Code of Practice for the UK or equivalent.

2.2.3 Policy SI 4 Managing Heat Risk

- A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.
- B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:
 - 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
 - 2) minimise internal heat generation through energy efficient design
 - 3) manage the heat within the building through exposed internal thermal mass and high ceilings
 - 4) provide passive ventilation
 - 5) provide mechanical ventilation
 - 6) provide active cooling systems.

2.2.4 Policy SI 5 Water Infrastructure

- A In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner.
- B Development Plans should promote improvements to water supply infrastructure to contribute to security of supply. This should be done in a timely, efficient and sustainable manner taking energy consumption into account.
- C Development proposals should:
 - through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)
 - 2) achieve at least the BREEAM excellent standard for the 'Wat 01' water category164 or equivalent (commercial development)
 - incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future-proofing.
- D In terms of water quality, Development Plans should:
 - 1) promote the protection and improvement of the water environment in line with the Thames River Basin Management Plan, and should take account of Catchment Plans
 - support wastewater treatment infrastructure investment to accommodate London's growth and climate change impacts. Such infrastructure should be constructed in a timely and sustainable manner taking account of new, smart technologies, intensification opportunities on existing sites, and energy implications. Boroughs

should work with Thames Water in relation to local wastewater infrastructure requirements.

E Development proposals should:

- 1) seek to improve the water environment and ensure that adequate wastewater infrastructure capacity is provided
- 2) take action to minimise the potential for misconnections between foul and surface water networks.
- F Development Plans and proposals for strategically or locally defined growth locations with particular flood risk constraints or where there is insufficient water infrastructure capacity should be informed by Integrated Water Management Strategies at an early stage

2.3 Local Policy – Local Plan (2018)

The Local Plan sets out the long term, vision, spatial strategy and strategic policies with an implementation plan up until 2033 to deliver sustainable development. The relevant policies within the Local Plan are listed below.

Policy LP 20

Climate Change Adaption

- A. The Council will promote and encourage development to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property.
- B. New development, in their layout, design, construction, materials, landscaping and operation, should minimise the effects of overheating as well as minimise energy consumption in accordance with the following cooling hierarchy:
 - 1. minimise internal heat generation through energy efficient design
 - 2. reduce the amount of heat entering a building in summer through shading, reducing solar reflectance, fenestration, insulation and green roofs and walls
 - 3. manage the heat within the building through exposed internal thermal mass and high ceilings
 - 4. passive ventilation
 - 5. mechanical ventilation
 - 6. active cooling systems (ensuring they are the lowest carbon options).
- C. Opportunities to adapt existing buildings, places and spaces to the likely effects of climate change should be maximised and will be supported.

Policy LP 22

Sustainable Design and Construction

- A. Developments will be required to achieve the highest standards of sustainable design and construction in order to mitigate against climate change. Applicants will be required to comply with the following:
- 1. Development of 1 dwelling unit or more, or 100sqm or more of non-residential floor space (including extensions) will be required to comply with the Sustainable Construction Checklist SPD. A completed Checklist has to be submitted as part of the planning application.
- 2. Development that results in a new residential dwelling, including conversions, change of use, and extensions that result in a new dwelling unit, will be required to incorporate water conservation measures to achieve maximum water consumption of 110 litres per person per day for homes (including an allowance of 5 litres or less per person per day for external water consumption).
- 3. New non-residential buildings over 100sqm will be required to meet BREEAM 'Excellent' standard.
- 4. Proposals for change of use to residential will be required to meet BREEAM Domestic Refurbishment 'Excellent' standard (where feasible).

Reducing Carbon Dioxide Emissions

- B. Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation. Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:
- 1. All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.
- 2. All other new residential buildings should achieve a 35% reduction.
- 3. All major non-residential buildings should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy.

Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2013 Building Regulations.

- C. This should be achieved by following the Energy Hierarchy:
- 1. Be lean: use less energy
- 2. Be clean: supply energy efficiently
- 3. Be green: use renewable energy

Decentralised Energy Networks

- D. The Council requires developments to contribute towards the Mayor of London target of 25% of heat and power to be generated through localised decentralised energy (DE) systems by 2025. The following will be required:
- 1. All new development will be required to connect to existing DE networks where feasible. This also applies where a DE network is planned and expected to be operational within 5 years of the development being completed.
- 2. Development proposals of 50 units or more, or new non-residential development of 1000sqm or more, will need to provide an assessment of the provision of on-site decentralised energy (DE) networks and combined heat and power (CHP).
- 3. Where feasible, new development of 50 units or more, or new non-residential development of 1000sqm or more, as well as schemes for the Proposal Sites identified in this Plan, will need to provide on-site DE and CHP; this is particularly necessary within the clusters identified for DE opportunities in the borough-wide Heat Mapping Study. Where on-site provision is not feasible,

provision should be made for future connection to a local DE network should one become available.

Applicants are required to consider the installation of low, or preferably ultra-low, NOx boilers to reduce the amount of NOx emitted in the borough.

Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged where appropriate.

Retrofitting

E. High standards of energy and water efficiency in existing developments will be supported wherever possible through retrofitting. Householder extensions and other development proposals that do not meet the thresholds set out in this policy are encouraged to comply with the Sustainable Construction Checklist SPD as far as possible, and opportunities for microgeneration of renewable energy will be supported in line with other policies in this Plan.

3 ENERGY DEMAND ASSESSMENT

3.1 National Calculation Methodology (NCM)

The baseline energy use and resulting carbon emission rate of the development has been assessed using the 2013 NCM methodology for the calculation of the regulated energy, such as space heating and domestic hot water consumption. NCM results for unregulated energy are also identified for information.

The emissions for the dwellings are based on a representative sample of 19 dwellings covering the lower mid level and top floors. The sample apartments were selected to represent all apartment types. Dwelling unregulated emissions are based on the BREDEM methodology.

It should be noted that as the energy consumption illustrated within this report is generated from the NCM and SAP methodologies and is not a prediction of the actual energy consumption.

The apartments were modelled using Stroma FSAP 2012 Version 1.0.4.16 and commercial spaces modelled using IES VE 2022, a Dynamic Simulation Software approved for generating Part L reports and Energy Performance Certificates.

Emissions within this report are based on the following CO₂ emission rates.

Natural Gas 0.210 kgCO₂/kWh
Grid electricity 0.233 kgCO₂/kWh
Grid displaced electricity 0.233 kgCO₂/kWh

As detailed within SAP10.

4 ENERGY EFFICIENT DESIGN

4.1 Dwellings

4.1.1 Passive Design Measures

The dwellings design will target highly efficient U-values for windows and air tightness.

Fabric Performance				
Element	Notional Dwelling Building Regulations, Part L1A 2013	Proposed Measures		
Air Tightness	5 0m ³ /hr per m ²	3.0 m ³ /hr per m ²		
External Wall U-Value	0.18 W/m²K	0.15 W/m ² K		
Spandrel Sections	0.18 W/m²K	0.35 W/m ² K		
Exposed Floor	0.13 W/m²K	0.11 W/m²K		
Roof	0.13 W/m²K	0.11 W/m²K		
Walls to unheated spaces*	0.13 W/m²K	0.16 W/m²K		
Party Wall**	0.00 W/m²K	0.00 W/m²K		
Glazing U-Value	1.4 W/m²K	1.0 W/m²K		
Glazing G-Value**	0.63	0.4		
Glazing LT	-	0.7		
Linear Thermal Transmittance	0.05	Default Y value of 0.15		

^{*} Includes corridors, stairwells, risers and smoke ventilation shafts

Proposed fabric efficiency measures are predicted No improvement of the Part L Dwelling Fabric Energy Efficiency (DFEE) over the Target Fabric Energy Efficiency (TFEE)

Residential Fabric Efficiency	TFEE	DFEE	Improvement (%)
Development Total	49.22	49.24	0.0%

4.1.2 Heating, Cooling and Ventilation

For this assessment boilers with a seasonal efficiency of 89.1% have been included, along with the corresponding flue gas heat recovery device from the boiler manufacturer within the houses. As the final proposal for the apartments includes heat pumps as the community heating system, the lean measures are based on boilers with an efficiency of 95% meeting the total heat demand.

Cooling will not be provided to any dwellings, which will rely on a combination of the fixed mechanical ventilation system and openable windows.

^{**} Wall between dwellings assumed to be constructed to approved method

Ventilation to the dwellings will be via balanced systems with heat recovery (MVHR). The MVHR unit used within the assessment is a Vent Axia Kinetic Advance S with the following SAP appendix Q test data; however, final unit selection will form part of the detailed design.

K+n wet rooms	SFP (W/I/s) [2012]	Efficiency (%) [2012]
n = 1	0.59	94%
n = 2	0.61	93%
n = 3	0.66	93%

4.1.3 Domestic Hot Water

Domestic hot water is responsible for approximately 41% of the regulated emissions, and in order to reduce these emissions, all domestic hot water pipework within the apartments will be insulated.

Whilst not having a direct impact on the building emissions a proportion of the water consumption is used as domestic hot water. The target dwelling water consumption rate is below 105lts/person/day.

4.1.4 Lighting

Within the dwellings, all fixed light fittings will be low energy lamps, including storage and infrequently accessed areas.

The lighting to common areas will be provided with PIR movement detectors and daylight control where appropriate.

4.1.5 Summary of Residential Carbon Emissions Following Energy Demand Reduction

The area weighted improvement over Part L (2013) for all the dwellings is 12% as illustrated in the table below. The full summary of the SAP results is detailed within appendix 3.

SAP 2012 Emission Rates	DER kgCO2/m2
Baseline Dwellings	17.97
Energy Efficient (Lean) Dwellings	15.76
Improvement	12%

The following tables indicate that an improvement of 11% is achieved when SAP 10 emission rates are applied with a CO₂ reduction of 14 tonnes.

Energy Consumption for energy baseline dwellings				
Item kWhrs/m²/ kWhrs/ Kg CO Year Year /year				
Heating (gas)	36.7	283910	59,621	
DHW (gas)	32.1	248252	52,133	
Cooling	0.0	0	0	
Auxiliary Energy	1.1	8400	1,957	
Lighting	4.5	34944	8,142	
Equipment	56.0	433,286	100,956	
Total	130	1,008,792	222,809	
Total no Equip	74	575,506	121,853	

Energy Consumption for energy efficient dwellings				
Item	kWhrs/m²/	kWhrs/	Kg CO ₂	
	Year	Year	/year	
Heating (gas)	29.5	228787	48,045	
DHW (gas)	28.9	223430	46,920	
Cooling	0.0	0	0	
Auxiliary Energy	2.4	18735	4,365	
Lighting	4.8	36795	8,573	
Equipment	56.0	433,286	100,956	
Total	122	941,033	208,860	
Total no Equip	66	507,747	107,904	

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy			
	Carbon dioxide emissions (Tonnes CO2 per annum)		
	Regulated Unregulated		
Building Regulations 2013 Part L compliant	122	101	
After energy demand reduction	108	101	
After CHP	108	101	
After Renewable Energy	53	101	

GLA Table 2: Dwelling Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
Regulated Carbon dioxide savings		
(Tonnes CO2 per annum) (%)		
Savings from energy demand reduction	14	11

4.2 Commercial Spaces

4.2.1 Passive Design Measures

The development will comply with building regulations through energy efficiency measures alone.

The design will target highly efficient U-values and air tightness, better than those used within the notional building calculation, as shown in the table below:

Fabric Performance			
Element	Notional Building Building Regulations, Part L2A 2013	Proposed Measures	
Air Tightness	3 0m ³ /hr per m ²	3.0 m ³ /hr per m ²	
External Wall U-Value	0.26 W/m ² K	0.18 W/m²K	
External Wall (to car park) U Value	0.26 W/m ² K	0.18 W/m²K	
Ground Floor	0.22 W/m²K	0.18 W/m²K	
Roof	0.18 W/m²K	0.13 W/m²K	
Walls to unheated spaces*	0.26 W/m²K	0.18 W/m²K	
Glazing U-Value	1.6 W/m²K	1.4 W/m²K	
Glazing G-Value	0.4	0.38	
Glazing LT	0.71	0.7	

^{*} Boundary to unheated residential circulation and ancillary spaces

4.2.2 Heating, Cooling and Ventilation

The following systems have been assumed for the fixed mechanical building services items within the energy efficient (Lean) building.

It should be noted that air source heat pumps are proposed as the heating source for all the commercial units therefore 91% efficient gas fired boilers have been included for this stage of the hierarchy.

Space	Heating system	Cooling System	Ventilation
Block 1	Gas fired Boilers	Air cooled split	Supply and extract
(small	91% efficiency	system	SFP - 1.0W/l/s
commercial units)		SEER – 4.0	Heat recovery – 75%
Block 2	Gas fired Boilers	Air cooled split	Natural ventilation
Work spaces	91% efficiency	system	
		SEER - 4.0	
Block 2	Gas fired Boilers	None	Natural ventilation
Circulation			
Block 2	Gas fired Boilers	None	Extract only
Toilets			SFP – 0.3W/l/s

4.2.3 Domestic Hot Water

Domestic hot water consumption is anticipated to be very low, therefore electric point of use water heating devices are assumed for the final design, however, gas fired water heaters are assumed within the energy efficient model in accordance with GLA guidance notes. To minimise any losses the water heaters will be complete with time controllers, and all pipework will be insulated up to outlets.

4.2.4 Lighting

Lighting is by far the largest consumer of energy within the commercial units. The table below summarises the principle lighting performance and controls used within the building simulation.

Space	Lamp Efficacy LI/cW	Lighting Control
Block 1 units	90	Manual control + photocell dimming at perimeter
Block 2 work space	100	Presence detection
Circulation	70	Manual Control
Toilets	70	Presence detection

4.2.5 Equipment

Equipment energy use or unregulated energy includes all the appliances, computers, and any other appliances belonging to the tenant, as the units are all being constructed on a speculative basis NCM equipment energy consumption has been identified for illustration purposes only.

4.2.6 Summary of Commercial Carbon Emissions Following Energy Demand Reduction

The area weighted improvement over Part L (2013) for all the commercial units is 19% as illustrated in the table below. The Part L2 outputs are detailed within appendix 7.

SAP 2012 Emission Rates	DER kgCO2
Baseline Commercial	14.17
Energy Efficient (Lean) Commercial	11.49
Improvement	19%

The annual energy consumption for the commercial units incorporating the energy efficiency measures described above are expected to reduce the emissions by 4 tonnes or 18% when SAP 10 emission rates are applied as detailed in the tables below.

Energy Consumption for Baseline Buildings (Non Residential)			
Item	kWhrs/m²/	kWhrs/	Kg CO ₂
iteiii	Year	Year	/year
Htg (Boilers)	16.3	32,553	6,836
DHW	2.7	5,303	1,114
Cooling	8.4	16,841	3,924
Auxiliary Energy	1.7	3,487	812
Lighting	19.9	39,641	9,236
Equipment	36.5	72,782	16,958
Total	86	170,607	38,881
Total no Equip	49	97,825	21,922

Energy Consumption for energy efficient Buildings (Non Residential) (Non Residential)					
Item	kWhrs/m²/ Year	kWhrs/ Year	Kg CO₂ /year		
Htg (Boilers)	16.3	32,473	6,819		
DHW	2.7	5,480	1,151		
Cooling	Cooling 3.9 7,793 1,8 ⁴				
Auxiliary Energy	Auxiliary Energy 3.5 7,003 1,6				
Lighting	Lighting 14.3 28,461 6,63				
Equipment 36.5 72,782 16,958					
Total 77 153,993 35,008					
Total no Equip	41	81,211	18,049		

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy			
Carbon dioxide emissions (Tonnes CO2 per annum)			
Regulated Unregulated			
Building Regulations 2013 Part L compliant 22 17			
After energy demand reduction 18 17			

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
Regulated Carbon dioxide savings		
(Tonnes CO2 per annum) (%)		
Savings from energy demand reduction 4 18		

4.3 Summary of Energy & Carbon Emissions Following Energy Demand Reduction

The annual energy consumption for the development incorporating the energy efficiency measures described above for residential and commercial uses are detailed in the following in the tables:

Table 6: Carbon Dioxide Emissions from each stage of the Energy Hierarchy				
Total Regulated CO2 Savings Percentage Savin				
(Tonnes CO2/year) (Tonnes CO2/year) %				
Part L 2013 Baseline 144				
Be Lean	126	18	12	

The tables above illustrate that the development will be energy efficient, with emissions 18% lower than the baseline building.

The energy demand for the various uses has also been calculated and is illustrated in the following table.

Energy Demand Following Efficiency	Build	ing Use
Measures (MWh/yr)	Domestic	Non-domestic
Space Heating	221	30
Hot Water	214	13
Lighting	37	17
Auxilary	15	19
Cooling	0	20
Unregulated Electricity	433	73
Unregulated Gas	0	0

5 RISK OF OVERHEATING

5.1 Dwellings

The Overheating Risk Assessment has been prepared using Dynamic thermal modelling and has been undertaken in accordance with the recommendations of Approved document Part O. which refers to CIBSE TM59 Design Methodology with minor amendments for the Assessment of Overheating Risk in Homes, and all apartments are classified as predominantly naturally ventilated.

The assessment is based on all apartments on the first and second floors to address the different apartment types that are at risk of overheating.

The CIBSE weather file for the London Heathrow was selected at the most appropriate location for the site. In accordance with the guidance within TM59, Design Summer Year (DSY)1 – 2020, High 50th Percentile has been used for the assessment.

Apartments at 1st and 2nd floor have been used within this sample assessment to indicate the anticipated performance of the apartments. All bedrooms are expected to comply with the criteria, with one sample lounge exceeding the criteria by one hour over the assessment period of May to September.

The overheating risk is largely due to the need to the need to achieve adequate daylight within the apartments, whilst considering the need to address the potential risk of overheating, with the following features incorporated within the design.

- The balconies are located one above the other to provide maximum external shading to the levels below.
- Solar control glazing is applied to all windows which will have a will have a G value of 0.38.
 The light transmission of the glass will not be below 70% and would not have a negative impact on the daylight amenity.

The houses have not been included within the assessment, these are less likely to overheat due to the ability of the units to achieve good cross flow ventilation from the front to the rear of the houses and have multiple levels allow the stack effect to increase ventilation rates on relatively still days by moving air from the ground to upper floors.

5.2 Non Dwelling Uses

It is assumed that the commercial spaces will be comfort cooled, with the following measures incorporated to minimise the cooling load.

The window designs have been optimised to maximise the daylight within the spaces, without leading to excessive solar gains, this has been achieved by limiting the use of full height glazing, and incorporating solar control glazing with a G value of 0.38 within the design.

The window frame design in Block 2 also has a significant impact in reducing the solar gain whist giving the impression of having large openings.

The majority of the units within Block 1 are dual aspect, however due to the room depth, natural ventilation is not viable and air quality is likely to deteriorate unless mechanical ventilation is provided.

Block 2 is relatively narrow, and has good natural ventilation potential on three elevations. Only limited openings are possible on the East elevation, but there are sufficient openings proposed to allow the building maintain acceptable air quality without the need for additional mechanical ventilation. Giving the building occupants the ability to provide natural ventilation should also encourage the users not to use the comfort cooling.

The Part L outputs which include solar gain checks indicate that all commercial spaces are compliant and the area weighted cooling demand for the actual buildings is around half that of the notional buildings as indicated in the table below.

	Area weighted average non- domestic cooling demand (mJ/m2)	Total area weighted non- domestic cooling demand (MJ/yr)
Actual	4.50	6387
Actual	7.00	0001

6 HEATING INFRASTRUCTURE

In accordance with GLA Energy Assessment Guidance (2018) and London Plan Policy SI3, the energy systems for the site have been determined in accordance with the following hierarchy:

- 1. Connection to existing low carbon heat distribution networks
- Use zero emission or local secondary heat sources (in conjunction with heat pump if required)
- 3. Use low-emission combined heat and power (CHP)
- 4. Use ultra low NOx gas boilers

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residencies and commercial units.

The London Heat map has been reviewed and the site is over 700m away from the edge of the nearest heat map study area.

Following the above hierarchy:

- 1. Their are no existing heat networks in the vicinity of the development
- 2. The site is within a developed sub urban area with a large number of terraced and semi detached houses. The London heat map identifies the site location as within an area of low heat density, it therefore unlikely that a district heating network will be extended to development.
- 3. A community heating system for the apartment block is proposed. Heat will be generated via heat pumps with the external condensing units mounted within a roof mounted compound. The system will be designed to operate at low temperatures 60°C F and 30°C R, to minimise the potential distribution losses.
- 4. The houses are located away from the apartment block and on opposite sides of the site. Serving the houses from the community system would lead to a significant increase of pipework used on site, which in turn would increase the heat losses from the heat network and increase the service charge for all residencies.
- 5. It is not proposed to connect the commercial units, to the community heating system, these spaces are heated and cooled, and would be better served by reverse cycle heat pumps to provide heating and cooling as detailed within the following section.

7 LOW & ZERO CARBON TECHNOLOGIES FOR ENERGY PRODUCTION

The use of energy conversion technologies using renewable energy have been reviewed and summarised below. The main technologies available for on-site renewable energy generation are:

- Biomass
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Photovoltaic Panels
- Solar Thermal Hot Water Generation
- Wind
- CHP

Refer to appendix 3 for more details and a brief explanation of renewable energy technologies.

7.1 Preliminary Technology Appraisal

Technology	Feasibility*		ty*	Comments
reciliology	Н	М	L	Comments
Biomass			1	Not suitable for the site on grounds of fuel storage and deliveries within city centre site and wider issues relating to high levels of NOx and particulate matter generated from combusting biomass fuels.
Ground Source heat pumps			1	Ground source heat pumps extract heat from the ground, and convert it to low grade heat for space heating and hot water.
				Ground source heat pumps would have to be connected to a community system, and as discussed in Section 6, the site is of insufficient scale to successfully operate as a communal heating system and is unlikely to connect into a wider heat network.
Air Source Heat Pumps	✓			Air source heat pumps extract heat from the air and convert it to low grade heat for space heating.
				Heat pumps can be configured to operate successfully with gas fired boilers, by pre heating the return water. This arrangement has the advantage of maximizing the operation period of the heat pump, whilst using boilers to meet the peak periods, when heat pumps are less effective with higher fuel costs.
				Air to air source heat pumps would be suitable for the commercial spaces particularly where these would be incorporated within a reverse cycle heat pump installation providing both space heating and cooling.

Technology	Feasibility*		Feasibil		bility* Comments		sibility* Comments	
recimology	Н	М	L	Comments				
Photovoltaic Panels	✓			Photovoltaic modules convert daylight directly into DC electricity and can be integrated into buildings.				
				Space is available at roof level of the apartment block and the houses to install a series PV arrays.				
Solar Hot water			✓	Solar thermal installations are a well established renewable energy system and can be one of the most cost-effective renewable energy systems available.				
				Solar thermal installations are best suited to single occupancy installations such as houses or hotels, where the hot water can feed directly into the users hot water storage vessel and are not viable for a mixed use scheme of this nature.				
				To minimise the number of technologies used on the development PV panels are preferred to solar thermal panels on the houses.				
Wind			✓	The urban environment and the close proximity of other buildings are not favourable conditions for the installation of wind turbines. The uneven air flow caused by surrounding buildings and the potential negative impact on the visual and noise amenity of the area militate against the use of wind turbines for this development.				

- H High Feasibility No Obvious restrictions
- M Medium feasibility Significant issues that need to be addressed
- L Low feasibility Site unlikely to support technology

Based on this preliminary evaluation, the following technologies will be assessed:

- Photovoltaic Panels (PV)
- Air source heat pumps

7.2 Photovoltaic Panels

7.2.1 Application

Photovoltaic modules convert daylight directly into DC electricity and can be integrated into buildings. Photovoltaics (PVs) are distinct from other renewable energy technologies since they have no moving parts to be maintained and are silent. PV systems can be incorporated into buildings in various ways: on sloped roofs and flat roofs, in facades, atria and shading devices. Modules can be mounted using frames or they can be fully incorporated into the actual building fabric; for example, PV roof tiles are now available which can be fitted in place of standard tiles. Since PVs generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form.



7.2.2 Constraints

The following constraints have been identified for the application of the PV technology at the site.

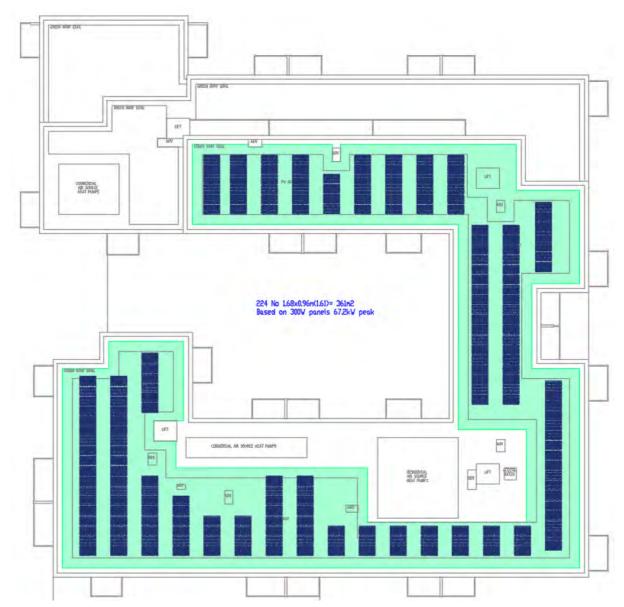
- 1. Connection points into the LV distribution system.
- 2. Over shadowing.
- 3. Power generated by the array on the apartment block roof will be connected to the landlords power supply, house mounted arrays will be connected to the individual property supplies.

7.2.3 Energy Reduction

Space is available on the roof of the apartment block to accommodate a 67.2kWp installation.

Approximately 360m2 of PV suitably placed on the green roofing system.

The arrays are predicted to generate 74,347kWh which equates to a CO2 reduction of 17.3 Tonnes of CO₂.



Indicative PV Layout on Residential Block

7.2.4 Conclusion

PV panels are a viable technology and are predicted to reduce the emissions to the dwellings by 9%.

7.3 Air Source heat Pumps

7.3.1 Application

The technology makes use of the energy available in the ambient air. Essentially, heat pumps take up heat at a certain temperature and release it at a higher temperature. This is achieved by means of a simple heat exchanger in the case of air source heat pumps.

The efficiency of any type of heat pump is very much dependent on the temperature level at which it has to provide the heat: the lower the temperature level, the better the coefficient of performance.

Almost all heat pumps in operation are based on the vapour compression cycle, which combines efficiency, safety and reasonable cost. The efficiency of heat pumps is measured by the ratio of the heating capacity to the power input, referred to as the Coefficient of Performance (COP). A seasonal COP of more than 4.0 is achievable from an air to air variable refrigerant flow system.

7.3.2 Constraints

The following constraints have been identified for the application of air source heat pump technology at the site.

1. Space needs to be allocated for the heat pumps in a location that provides a good air flow through and around the units.

7.3.3 Energy Reduction

Remodelling the commercial units, exchanging the gas fired heating plant assumed within the energy efficient models with air source heat pumps with an SCOP of 2.57 will reduce the commercial buildings energy consumption by 1137 kWh below the energy efficient model.

The houses were re assessed using the SAP software, exchanging the gas boilers for monoblock heat pumps with hot water storage cylinders taken from the NCM Product Characteristic Database.

Within the residential community heating plant serving the apartments, air source heat pumps can be installed to generate 100% of the heating demand, an SCOP of 2.57 has been calculated for this assessment, utilising data from a manufacturer included within Appendix 4 and sink temperatures taken from the CIBSE TRY for London.

An assessment of the distribution losses has also been undertaken and a summary of the calculation is included within Appendix 5 demonstrating that the annual distribution losses are predicted to equate to 20%.

A heat pump installation with a duty of approximately 250kW will meet 100% of the annual heat requirements resulting in a 36% CO₂ reduction.

The performance of the heat pump(s) will be monitored via the Building Management System, with sub meters monitoring the heat generated from the heat pumps and the power consumption. This will then be periodically compared to the building gas consumption and heat generated by the boilers.

7.3.4 Conclusion

The PV panels mounted on the roofs of the houses and the apartment block will have a total peak capacity of 67.2Wp, and reduce the dwelling emissions by 12 tonnes or 9%.

The provision of the heat pump within the community heating system and exchanging the boilers for heat pumps within the houses reduces the emissions by 43 tonnes or 36%

The combination of heat pumps and PV panels reduces the emissions from the dwelling by 41 tonnes as illustrated in the tables below.

Energy Consumption for energy efficient dwellings with Renewable Technology								
Item	kWhrs/m²/ kWhrs/ Ka CC							
Heating (gas)	0.0	202	42					
DHW (gas)	0.0	235	49					
Heating (Heat Pump)	15.7	121,198	28,239					
DHW (Heat Pump)	12.9	100,058	23,314					
Cooling	0.0	0	0					
Auxiliary Energy	2.4	18,735	4,365					
Lighting	4.8	36,795	8,573					
CHP Heat	0.0	0	0					
CHP Electricity	0.0	0	0					
PV Electricity	-6.6	-50,781	-11,832					
Equipment	56.0	433,286	100,956					
Total	85	659,730	153,707					
Total no Equip	29	226,443	52,751					

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy				
		ide emissions 2 per annum)		
	Regulated	Unregulated		
Building Regulations 2013 Part L compliant	122	101		
After energy demand reduction	108	101		
After CHP	108	101		
After Renewable Energy	53	101		

GLA Table 2: Dwelling Carbon Dioxide Emissions from each stage of the Energy Hierarchy			
Regulated Carbon dioxide			
	savings		
	(Tonnes CO2	(%)	
	per annum)	(/0)	
Savings from energy demand reduction	14	11	
Savings from CHP	0	0	
Savings from renewable energy	55	45	

Air source heat pumps are a viable technology for the commercial units in the form of an air to air heat pump, and are predicted to reduce the emissions to these uses by 36%

Energy Consumption for energy efficient buildings with Renewable Technology (Non Residential)					
Item	kWhrs/m²/		Kg CO₂		
	Year	Year	/year		
Boiler Htg	0.0	0	0		
DHW	2.4	4,823	1,124		
Htg. (heat pump)	5.4	10,747	2,504		
Htg. (Elec)	0.0	0	0		
Cooling	3.9	7,776	1,812		
Auxiliary Energy	2.5	4,988	1,162		
Lighting	14.3	28,461	6,631		
CHP Heat	0.0	0	0		
CHP Electricity	0.0	0	0		
PV Electricity	0.0	0	0		
Equipment	36.5	72,782	16,958		
Total	65	129,577	30,191		
Total no Equip	28	56,795	13,233		

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy				
	Carbon dioxide emissions (Tonnes CO2 per annum)			
	Regulated	Unregulated		
Building Regulations 2013 Part L compliant	22	17		
After energy demand reduction	18	17		
After CHP	18	17		
After Renewable Energy	13	17		

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy			
	Regulated Carbon dioxide savings		
	(Tonnes CO2 per annum) (%)		
Savings from energy demand reduction	4	18	
Savings from CHP	0	0	
Savings from renewable energy	5	22	

7.4 Energy & Emissions Following the Introduction of Renewable Technologies

In total the air source heat pump installations and PV panels are predicted to reduce the emissions from the development by 60 tonnes or 42% of the baseline development emissions.

Table 6: Carbon Dioxide Emissions from each stage of the Energy Hierarchy						
Total Regulated CO2 Savings Percentage Saving						
	(Tonnes CO2/year)	(Tonnes CO2/year)	%			
Part L 2013 Baseline	144					
Be Lean	126	18	12			
Be Clean	126	0	0			
Be Green	66	60	42			

8 CONCLUSIONS

Following a recent review of the relevant National and Local Planning Policies, this Energy Assessment proposes a strategy that positively responds to the London Plan, Policies SI2 and SI3, the Mayor's Energy Assessment Guidance, and Policy LP22 Sustainable Design and Construction of Richmond upon Thames Local Plan (2018).

The energy efficiency measures include good fabric insulation, triple glazing, improved air tightness, high efficiency balanced whole house heat recovery units, and low energy lighting throughout. Commercial units will be fitted out with low energy light fittings with photocell controls and energy efficient ventilation systems.

The energy efficiency measures are calculated to reduce the dwelling emissions by 13% and 19% for the commercial units, when SAP 2012 emission rates are applied.

The site is not within an area described as having district heating potential as identified within the London Heat Map, and the surrounding developments are predominantly privately owned terraced or semi-detached houses with a low heat density. However, it is proposed to serve the apartments from a community heating system with an air source heat pump contributing 100% of the annual heat demand. Dedicated heat pumps will provide all the space heating and hot water within the houses and reverse cycle heat pumps providing space heating and cooling will be used to serve the commercial units.

In addition to the various heat pump installations, a 67.2Wp PV array will be mounted on the roof of the apartments block.

The total reduction of regulated emissions, once energy efficiency measures and renewable energy is considered for the whole development is 54% based on NCM building performance and SAP10 emission rates.

Table 6: Carbon Dioxide Emissions from each stage of the Energy Hierarchy							
	Total Regulated CO2 Savings Percentage Saving						
	(Tonnes CO2/year)	(Tonnes CO2/year)	%				
Part L 2013 Baseline	144						
Be Lean	126	18	12				
Be Clean	126	0	0				
Be Green	66	60	42				
Cumulative Saving		78	54				
Total off-set £		188,056					

The zero carbon homes CO₂ offset payment is calculated to be £188,056 for the dwellings based on £95.00 / tonne over a 30 year period.

A1 APPENDIX 1 – WATER CALCULATOR

Approved Document G - Table A1 Water Efficiency Calculator for Dwellings

Project Ref: St Clare Business Park

property Type: Dwelling



Installation Type	Unit of Measure	Capacity /flow rate	Use factor	Fixed use (litres/ person/	litres/ person/day
WC Single Flush	Flush Volume (litres)	0	4.42	0	0.00
WC Dual Flush	Full flush volume (litres)	6	1.46	О	8.76
WC Duai Flush	Part flush volume (litres)	4	2.96	0	11.84
WC's Multiple fittings	Average effective flushing volume (litres)	0.0	4.42	0	0.00
Taps (Excluding kitchen/utility room taps	Flow rate (litres/min)	5.0	1.58	1.58	9.48
Bath (where shower also present)	Capacity to overflow	130	0.11	0	14.30
Shower (where bath is also present)	Flow rate (litres/min)	8	4.37	0	34.96
Bath only	Capacity to overflow	0	0.5	0	0.00
Shower only	Flow rate (litres/min)	0	5.6	0	0.00
kitchen/utility sink taps	Flow rate (litres/min)	6	0.44	10.36	13.00
Washing machine	Litres/kg dgy load	8.87	2.1	0	18.63
Dishwasher	Litres/place setting	1	3.6	0	3.60
Waste disposal unit	Litres/use (if present=1, if absent=0)	0	3.08	0	0.00
water softener	Litre/person/day	0	1	0	0.00
	Total calculated Use				114.57
	Contribution from grey w	ater (litre	s /person/	′day)	0.00
	Contribution from rain water (litres /person/day)				
	Normalisation factor				
	Total water consumption				
	External water use				
Total water consumption					109.26

A2 APPENDIX 2 - RENEWABLE ENERGY OVERVIEW

The information in this appendix is not project specific and is intended to provide an overview of the technologies described.

A2.1 Biofuels

A2.1.1 Background

Biomass is an alternative solid fuel to the conventional fossil fuels and has an impact on carbon emissions that is close to neutral. Various types of biomass fuels are in use, the most common being the woody biomass, which includes forest residues such as tree thinnings, and energy crops such as willow short rotation coppice. The fuel usually takes the form of wood chips, logs and pellets. Supply and storage of the biomass fuel should be carefully considered especially for larger plants. Modern systems can be fed automatically by screw drives from fuel hoppers.

The typical applications are:

- a. Biomass boilers replacing standard gas- or oil -fired boilers for space heating and hot water (for individual buildings or district heating systems).
- b. Standalone room heaters for space heating.
- c. Stoves with back boilers, supplying domestic hot water.
- d. Biomass CHP for heat and electricity generation.

Appliances can achieve efficiencies of more than 80%.

The capital cost of automated biomass heating systems is significantly greater than that of conventional heating systems, mainly because of the more complicated feeding mechanisms and the currently smaller market for biomass appliances.

There is an ongoing public debate on the true sustainability of using biofuels. Given the number of differing views expressed by academics and engineers and contradictions in publications issued by the Government the theoretical carbon savings offered by biofuels must be treated with extreme caution. 3.1.2 to 3.1.5 below expands on this.

A2.1.2 Biofuels as a Sustainable Resource

Research undertaken by AEA technology on behalf of the Department for Transport2 stated that 'Research has shown that biofuels can reduce carbon emissions, yet they are currently a controversial area of science. Insufficient data exists to fully understand the impact of biofuel production on communities and the environment; and, whilst biofuels could be a powerful tool in reducing carbon emissions, they must be produced in a sustainable manner if they are not to do more harm than good' then states that 'biofuels are currently a controversial topic area, and it is difficult to move forward in such circumstances'. The research paper listed 4 key findings:

Key finding 1: We need to improve our understanding of the indirect impacts of biofuels, particularly indirect land use change;

Key finding 2: We need to improve our knowledge of the environmental, socioeconomic and supply-chain impacts of biofuels;

Key finding 3: There is a need for new research to examine the evolution of the production, infrastructure and vehicle technologies necessary to enable us to meet longer-term biofuels targets for transport and for improving the sustainability of biofuels;

Key finding 4: There are a number of cross-cutting research gaps that need to be addressed in order to support the development of biofuels policy

² Biofuels Research Gap Analysis, Department for Transport, July 2009

According to the Renewable Fuels Agency3 only 18% of the liquid biofuels consumed in the UK originate in the UK. 30% of liquid biofuels originates in Brazil, and the sustainability of their production and the consequent deforestation are the topic of wider debate.

The carbon emission factor stated in the Standard Assessment Procedure (SAP) 2009 for biodiesel is 0.047kg CO2/kWhr. (The SAP methodology is used to calculate the energy consumption and carbon emissions from dwellings to demonstrate compliance with the Building Regulations and generate Energy Performance Certificates). Data published by the Renewable Fuels Agency4 shows that the mean carbon emission factor for biodiesel consumed in the UK is 0.148kgCO2/kWhr (41 gCO2e/MJ), this compares to the carbon emission factor for natural gas of 0.198kgCO2/kWhr. Given that there is a limited supply of biofuel it would be reasonable to use the mean value for the emission factor; this principle is applied to mains electricity where the carbon emissions from all sources of electricity generation are aggregated to arrive at a mean value.

The carbon emission factor stated in the SAP 2009 for wood pellets is 0.028kg CO2/kWhr. Research by AEA Technology on behalf of the Environment Agency5 showed that the emissions are actually between 0.050 and 0.140 kg CO2/kWhr, with 0.1 kgCO2/kWhr being a typical value for good practice. From this it can be concluded that the carbon savings stated when using the SAP values are overstated.

Biodiesel CHP may be technically viable for the development but the lack of certainty over the sustainability of liquid biofuels militates against this. In addition to this, concerns over the future availability of fuel supplies are a consideration. The European Renewable Energy Directive (RED) commits the UK to sourcing 10 percent of its transport energy from renewable sources by 20206. Currently only 3.5% of transport energy is from renewable sources, and 82% of this is imported. It is reasonable to conclude that as the volume of liquid biofuel that is legally required to be used for transport energy increases, the supply of the fuel for other purposes will become more expensive and difficult to procure.

A2.2 Air and Ground Source Heat Pumps

A2.2.1.1 Background

The technology makes use of the energy available in the ambient air or stored in the Earth's crust, which comes mainly from solar radiation. Essentially, heat pumps take up heat at a certain temperature and release it at a higher temperature. This is achieved by means of a simple heat exchanger in the case of air source heat pumps, or by means of either horizontal or vertical ground collectors, in which a heat exchange fluid circulates and transfers heat via a heat exchanger to the heat pump, in the case of ground source heat pumps. For the latter, when considering buildings with piled foundations, the pipes can be integrated in the design using several piling systems.

The efficiency of any type of heat pump is very much dependent on the temperature level at which it has to provide the heat: the lower the temperature level, the better the coefficient of performance.

Almost all heat pumps in operation are based on the vapour compression cycle, which combines efficiency, safety and reasonable cost. The efficiency of heat pumps is measured by the ratio of the heating capacity to the power input, referred to as the Coefficient of Performance (COP). Generally, a COP of around 2.5-3 for air source heat pumps and around 3.5-4 for ground source heat pumps is achievable for heating, assuming low temperature heat emitters such as underfloor heating. When used to generate domestic hot water at 60°C the COP falls for both types of heat pumps by around 1 point. Therefore, when it comes to domestic hot water, heat pumps can be implemented to pre-heat the water up to a certain temperature, before it enters the boiler, rather than to heat up the domestic hot water entirely up to its final required temperature.

³ Renewable Fuels Agency Quarterly Report Apr 2010 to October 2010

⁴ Renewable Fuels Agency Quarterly Report Apr 2010 to October 2010

⁵ Biomass: Carbon sink or carbon sinner?, Environment Agency, April 2009

⁶ Department of Energy and Climate Change website.

The approximate costs for heat pumps amount to £700 per kWth heat output for an air source heat pump, and £1,200 per kWth heat output for a ground source heat pump with horizontal trenches, and £1,400 per kWth heat output for a ground source heat pump with vertical boreholes (including the cost of bore holes).

A2.3 Solar Water Heating Systems

A2.3.1.1 Background

Solar thermal and, especially, active Solar Domestic Hot Water (SDHW) heating is a well -established renewable energy system in many countries outside the UK. It can be one of the most cost-effective renewable energy systems available.

It is appropriate for both residential and non-residential applications, and there are currently in the order of 80,000 installations in the UK.

Solar thermal systems in the UK normally operate with a back-up source of heat, such as gas or electricity. The solar system pre-heats the incoming cold water, which is topped up by the back-up heat source when there is insufficient solar energy to reach the chosen target temperature.

Solar collectors are best mounted at an incline with a southerly orientation, although orientations between south-east and south-west are acceptable. The panels can be fixed to the roof or walls.

There are three main types of solar collector that can be used in SDHW systems. These are:

- a. Evacuated tubes.
- b. Glazed selective surfaced flat plate.
- c. Glazed non-selective surfaced flat plate.

Evacuated tube collectors are generally more expensive than flat plate type but offer an improved performance, particularly in the winter.

A2.4 Photovoltaics

A2.4.1.1 Background

Photovoltaic modules convert daylight directly into DC electricity and can be integrated into buildings. Photovoltaics (PVs) are distinct from other renewable energy technologies since they have no moving parts to be maintained and are silent. PV systems can be incorporated into buildings in various ways: on sloped roofs and flat roofs, in facades, atria and shading devices. Modules can be mounted using frames or they can be fully incorporated into the actual building fabric; for example, PV roof tiles are now available which can be fitted in place of standard tiles. Since PVs generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form. The cost of the inverter and these components can approach 50% of the total cost of a PV system.

For PV to work effectively it should ideally face south and at an incline of 30° to the horizontal, although orientations within 45° of south are acceptable. It is essential that the system is unshaded, as even a small shadow may significantly reduce output.

A2.5 Wind Energy

A2.5.1.1 Background

Most wind turbines are installed in non-urban areas for environmental and technical reasons. However, it has become more common for smaller devices installed at the point of use, i.e. urban settings. The capacity of wind turbines range from 500W to more than 1.5 MW, but, for practical purposes and in built-up areas in particular, machines of more than 1 kW and below 500kW are likely to be considered. Individual building or community wind projects, although smaller, have the advantage of feeding electricity directly into the building's electricity circuit, thus sparing costly distribution network development and avoiding distribution losses. The downside is the still high capital cost per kW installed for smaller turbines, plus location constraints, such as visual intrusion and noise. The wind

regime in urban areas is also a concern owing to higher wind turbulence which reduces the potential electricity output.

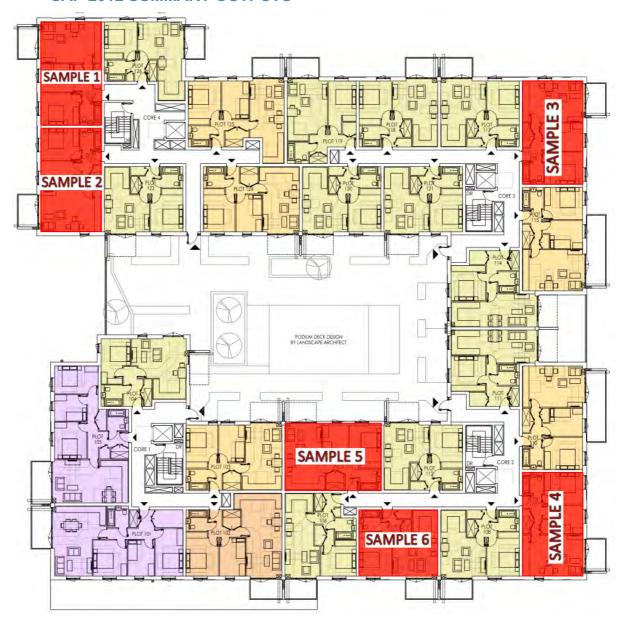
In most cases, wind turbines are connected to the electricity grid and all generated energy is used regardless of the building demand fluctuations. The output largely depends on the wind speed and the correlation between the two is a cube function. This means that in short periods of above-average wind speeds the generation increases exponentially. As a result, it is difficult to make precise calculations of the annual output of a turbine, but average figures can provide useful guidance.

The cost per kW installed varies considerably by manufacturer and size of machine with an indicative bracket of £2,500-£5, 000. With a lifespan of more than 20 years, wind turbines can save money if design and planning are carried out in a robust way.

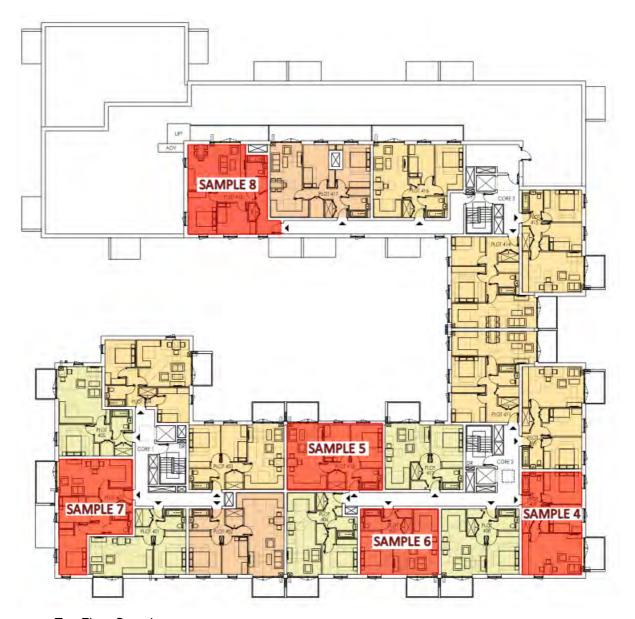
Wind Turbine Options

Wind turbines can be mounted on horizontal or vertical axes. The horizontal mounted turbines are less expensive (around £ 20,000 for a 6 kW turbine) but generate more vibrations. The vertical mounted turbines are more expensive (around £ 22,000 for a 5 kW turbine), but almost vibration free. The table below shows the most relevant figures for both types of turbines.

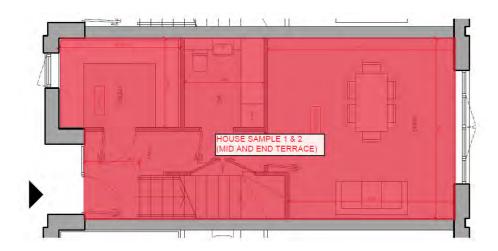
A3 APPENDIX 3 – ENERGY ASSESSMENT SAMPLE APARTMENTS AND SAP 2012 SUMMARY OUTPUTS



Typical Floor Samples



Top Floor Samples



				SAP 20	112 Summary (Baseline)					
Sample Dwelling Ref	Sample Quantity	Area (m2)	Space Heating	Emission Factor	Domestic Hot water	Emission Factor	Lighting	Auxilary	Cooling	TER (kgCO2/m2)	TFEE (kWh/m2)
Sample 1 (Mid)	4	66.25	1837.53	0.216	2266.36	0.216	303.98	75.00	0.00	16.35	38.30
Sample 2 (Mid)	2	66.25	2464.02	0.216	2251.60	0.216	297.09	75.00	0.00	18.29	48.80
Sample 3 (Mid)	3	67	1543.19	0.216	2285.73	0.216	307.48	75.00	0.00	15.31	33.00
Sample 4 (Mid)	2	67	1768.27	0.216	2278.40	0.216	307.48	75.00	0.00	16.01	36.70
Sample 5 (Mid)	8	67	1752.01	0.216	2278.25	0.216	324.50	75.00	0.00	16.09	36.50
Sample 6 (Mid)	8	55.1	1636.45	0.216	2129.86	0.216	262.71	75.00	0.00	17.95	41.60
Sample 1 (Bottom)	6	66.25	2583.67	0.216	2248.27	0.216	303.98	75.00	0.00	18.72	50.50
Sample 2 (Bottom)	4	66.25	3189.00	0.216	2238.34	0.216	297.09	75.00	0.00	20.61	60.80
Sample 3 (Bottom)	5	67	2253.78	0.216	2265.21	0.216	307.48	75.00	0.00	17.53	44.60
Sample 4 (Bottom)	4	67	2482.24	0.216	2260.02	0.216	307.48	75.00	0.00	18.25	48.30
Sample 5 (Bottom)	16	67	2500.39	0.216	2259.13	0.216	324.50	75.00	0.00	18.44	48.60
Sample 6 (Bottom)	16	55.1	2243.46	0.216	2114.03	0.216	262.71	75.00	0.00	20.26	53.50
Sample 4 (Top)	4	67	2482.24	0.216	2260.02	0.216	307.48	75.00	0.00	18.25	48.30
Sample 5 (Top)	5	67	2500.39	0.216	2259.13	0.216	324.50	75.00	0.00	18.44	48.60
Sample 6 (Top)	5	55.1	2243.46	0.216	2114.03	0.216	262.71	75.00	0.00	20.26	53.50
Sample 7 (Top)	2	66.3	2555.24	0.216	2249.44	0.216	304.21	75.00	0.00	18.62	50.10
Sample 8 (Top)	4	70	3562.87	0.216	2275.03	0.216	321.47	75.00	0.00	20.95	63.50
House Sample 1	8	129	5300.10	0.216	2590.68	0.216	478.94	75.00	0.00	15.44	49.00
House Sample 2	6	129	6529.87	0.216	2582.54	0.216	466.84	75.00	0.00	17.44	60.30
		2005.5	007500		050750		05040	0.400			
Sample Apartments		8025.5	307500		253753		35913	8400	0		40.00
Area Weighted Value		7744	296714		244852		34653	8105	0	17.97	49.22

				SAP 2	2012 Summary	• •					
Sample Dwelling Ref	Sample Quantity	Area (m2)	Space Heating	Emission Factor	Domestic Hot water	Emission Factor	Lighting	Auxilary	Cooling	DER (kgCO2/m2)	DFEE (kWh/m2)
Sample 1 (Mid)	4	66.25	691.91	0.216	1972.57	0.216	311.73	143.52	0		32.80
Sample 2 (Mid)	2	66.25	1555.97	0.216	1972.57	0.216	296.83	151.73	0		45.10
Sample 3 (Mid)	3	67	728.51	0.216	1979.61	0.216	315.44	145.27	0		32.10
Sample 4 (Mid)	2	67	1018.59	0.216	1979.61	0.216	315.44	148.02	0		36.60
Sample 5 (Mid)	8	67	753.75	0.216	1979.61	0.216	334.24	145.51	0		33.90
Sample 6 (Mid)	8	55.1	870.01	0.216	1859.73	0.216	270.05	124.24	0		39.40
Sample 1 (Bottom)	6	66.25	1809.12	0.216	1972.57	0.216	311.73	154.14	0		48.70
Sample 2 (Bottom)	4	66.25	2677.97	0.216	1972.57	0.216	296.83	162.39	0		60.40
Sample 3 (Bottom)	5	67	1793.51	0.216	1979.61	0.216	315.44	155.38	0		47.60
Sample 4 (Bottom)	4	67	2115.99	0.216	1979.61	0.216	315.44	158.45	0		52.00
Sample 5 (Bottom)	16	67	1877.38	0.216	1979.61	0.216	334.24	156.18	0		49.70
Sample 6 (Bottom)	16	55.1	1795.66	0.216	1859.73	0.216	270.05	133.04	0		55.00
Sample 4 (Top)	4	67	2115.99	0.216	1979.61	0.216	315.44	158.45	0		52.00
Sample 5 (Top)	5	67	1877.38	0.216	1979.61	0.216	334.24	156.18	0	16.23	49.70
Sample 6 (Top)	5	55.1	1795.66	0.216	1859.73	0.216	270.05	133.04	0	18.13	55.00
Sample 7 (Top)	2	66.3	1791.57	0.216	1973.04	0.216	311.98	154.06	0		48.40
Sample 8 (Top)	4	70	3135.97	0.216	2006.86	0.216	330.25	173.76	0	19.61	64.70
House Sample 1	8	129	4095.62	0.216	2487.69	0.216	491.27	367.71	0		48.00
House Sample 2	6	129	5937.71	0.216	2458.72	0.216	469.94	384.94	0	16.47	60.50
Sample Apartments		8025.5	232206		225162		36795	19714	0		
Area Weighted Value		7744	224062		217265		35505	19023	0		49.24

II Product Data

1. Capacity tables

- (1) Correction by temperature
- CAHV-P500YA-HPB(-BS)
- (1)-1 Efficiency Priority Mode

 Capacity 								Intal	ce air ter	mperatur	e °C						
		-20	-15	-10	-7	-5	0	2	5	7	10	16	20	25	30	35	40
	35	-	-	40.3	42.2	42.4	42.7	42.8	43.5	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
	45	32.0	37.4	40.6	42.4	42.6	42.9	43.0	43.5	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Outlet water temperature	55	32.2	37.7	40.8	42.7	42.8	43.1	43.2	43.6	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
°C	60	32.2	37.8	40.9	42.8	42.9	43.2	43.3	43.7	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
	65	32.2	37.9	41.0	42.9	43.0	43.3	43.4	43.7	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
	70	-	-	41.1	43.0	43.1	43.4	43.5	43.7	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

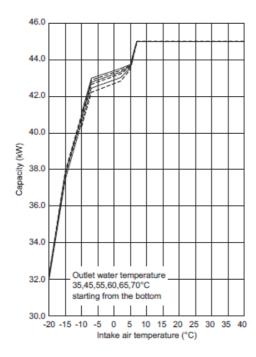
This table shows the capacity when the relative humidity is 85%.

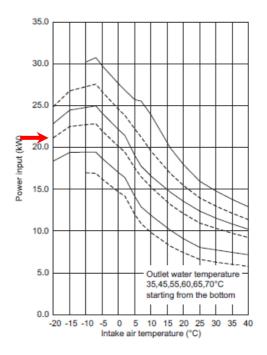
The intake wet-bulb temperature is fixed to 32°C when the intake dry-bulb temperature is 35°C or higher.

 Power input 	ut							Intal	ce air ter	mperatur	e °C						
		-20	-15	-10	-7	-5	0	2	5	7	10	16	20	25	30	35	40
	35	-	-	17.0	16.9	16.2	14.7	14.2	12.0	10.9	9.82	8.20	7.40	6.60	6.30	6.02	5.77
	45	18.4	19.4	19.4	19.5	18.7	17.0	16.4	14.2	12.9	11.9	10.1	9.08	8.05	7.73	7.44	7.17
Outlet water		24.2	22.5	22.7	22.0	22.0	20.4	40.5	47.5	10.5	45.0	12.2	10.1	44.0	10.0	0.75	0.04
temperature °C	60	22.9	24.5	24.8	25.0	24.1	22.1	21.4	19.1	17.8	16.6	14.7	13.6	12.4	11.6	10.8	10.2
	-00	21.0	20.0	27.0	27.0	20.7	21.0	20.0		21.0	10.0	10.0	10.1	17.0	10.0	14.1	111-1
	70	-	-	30.2	30.8	29.8	27.6	26.9	25.7	25.6	23.9	19.9	18.0	16.0	14.8	13.8	12.9

This table shows the power input when the relative humidity is 85%.

The intake wet-bulb temperature is fixed to 32°C when the intake dry-bulb temperature is 35°C or higher.





A5 APPENDIX 5 – COMMUNITY HEATING SYSTEM LOSSES

	Dist	ribution Loss F	actor Calculation	
System Flow	temp	65°0		
System Retur	n Temp	35°0	C	
Mean water te	emp	50°0	С	
Kingspan hea		enhanced insula		
Pipe size 20 25 32 40 50 65	W/m 95°C 9 9.86 10.83 11.42 12.61 14.12	W/m 60°C 7 7.71 8.46 9.01 9.94 11.25	W/m 50°C 6.43 7.10 7.78 8.32 9.18 10.43	
80 100	15.28 17.51	12.17 14.29	11.28 13.37	
No of floors/Apart ments 98 4 4 1 1 0	length 6 120 6 150 40 0	pipe size 25 25 32 40 50 65	heat loss (W/m) 7.71 7.71 8.46 9.01 9.94 9.18	Total (W) 4533 3701 203 1352 398 0
Measured Los Unaccounted Total Assume	losses from br	eaks in insulatio	on @ 10%	10.19 kW 1.02 kW 11.21 kW
Annual Losse	s			98168 kWh
Total Heat out	put			503018 kWh
Distribution I	oss factor			1.20

APPENDIX 6 – LEAN TER, DER AND SAP INPUTS **A6**

SAP Input

Property Details: Sample 1 (Mid)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2019

Floor Location: Floor area:

Storey height:

Floor 0 66.25 m² 3 m

Living area: 27.2 m² (fraction 0.411)

Front of dwelling faces: Unspecified

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	Frame:
DOOR	Manufacturer	Solid			W <mark>ood</mark>
Balcon	y Manufacturer	Windows	low-E, $En = 0.05$, soft co	oat No	
N	Manufacturer	Windows	low-E, En = 0.05 , soft co	oat No	
E	Manufacturer	Windows	low-E, En = 0.05 , soft co	oat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
Balcony		0.7	0.4	1	4.8	1
N		0.7	0.4	1	5.44	1
F		0.7	0.4	1	1 1/1	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
Balcony		N	North	0	0
N		N	North	0	0
E		Е	East	0	0

Overshading: Heavy

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>:S</u>						
N	10.24	10.24	0	0.15	0	False	N/A
E	1.44	1.44	0	0.15	0	False	N/A
INT	13.2	2.4	10.8	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

Thermal bridges:

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	FSAP 201	2		Strom Softwa	a Num are Vei			Versio	on: 1.0.5.51	
			P	roperty	Address	: Sample	e 1 (Mid))			
Address :											
1. Overall dwelling dime	ensions:			A ===	a (2 \		Av. Ha	: a.b.4/\		Values a/m²	21
Ground floor					a(m²) 66.25	(1a) x		ight(m)	(2a) =	Volume(m) 198.75	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	ገ) 6	6.25	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	198.75	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdar neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ır
Number of open flues	0	╡ + ト	0	╡ + ⊨	0	_ 	0	x	20 =	0	(6b)
Number of intermittent fa		L		J L		J	0		10 =	0	(7a)
Number of passive vents						Ļ			10 =		╡`′
·						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has t			ed, procee	ed to (17),	otherwise (continue fr	om (9) to ((16)			_
Number of storeys in t Additional infiltration	he dwelling	(ns)						[(0)	-1]x0.1 =	0	(9)
Structural infiltration: 0	25 for steel	or timber	frame o	: 0.35 fo	r masoni	ry constr	uction	[(9)]	-1]XU.1 =	0	(10)
if both types of wall are p						•					(/
deducting areas of openi	• /		۰ ۱ ۱	4 (I\						
If suspended wooden If no draught lobby, er		•	iea) or u	.1 (seale	ea), eise	enter U				0	(12)
Percentage of window			tripped							0	(13)
Window infiltration	o and accio	draagiii o	прроц		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expres	sed in cub	oic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, th	en (18) = [(1	7) ÷ 20]+(8), otherw	ise (18) =	(16)				0.15	(18)
Air permeability value applie		ation test ha	s been doi	ne or a de	gree air pe	rmeability	is being us	sed			_
Number of sides shelters Shelter factor	ed				(20) = 1 -	[0.075 x (1	19)1 =			2	(19)
Infiltration rate incorpora	tina shelter t	actor			(21) = (18	`	. •/1			0.85	(20)
Infiltration rate modified	•		4		(= -)	, (=0)				0.13	(21)
Jan Feb	Mar Api		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp			1	1	1	1 226	1	1		J	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.				•	•			•	•	1	
Wind Factor $(22a)m = (2a)m =$			l	I		l .				1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		•	rate for t	he appli	cable ca	se		l	l	•			
If mechanica			l' N. (0	al.) (aa	\ - /			. (00)	\ (00 \			0.5	(238
If exhaust air h) = (23a)			0.5	(23k
If balanced with		•	-	_								79.05	(230
a) If balance	ı —					- ` 	- ^ ` 	ŕ	– 		- `) ÷ 100] 1	(0.4-
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24a
b) If balance	i						 	í `	r ´ `	- 	Ι ,	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24k
c) If whole h				•					5 × (23b	o)		-	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and he	eat loss	paramete	er:							_	_	
ELEMENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1.4	=	3.36				(26)
Win <mark>dows</mark> Type	e 1				4.8	x	1/[1/(1)+	0.04] =	4.62	П			(27)
Windows Type	2				5.44	x	1/[1/(1)+	0.04] =	5.23	Ħ			(27)
Windows Type	3				1.44	×	1/[1/(1)+	0.04] =	1.38	5			(27)
Walls Type1	10.2	24	10.24	4	0	x	0.15	=	0	= [(29)
Walls Type2	1.4	4	1.44		0	x	0.15	=	0	Ħ i		7 F	(29)
Walls Type3	13.:	2	2.4		10.8	X	0.15		1.62			-	(29)
Walls Type4	2.4		0		2.4	x	0.35	-	0.84	=		= =	(29)
Total area of e	lements	 , m²			27.28	<u> </u>							(31)
* for windows and			effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	` '
** include the area	as on both	sides of in	nternal wal	ls and par	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				17.05	(33)
Heat capacity		,						((28).	(30) + (32	2) + (32a).	(32e) =	184.8	(34)
Thermal mass	•	`		,					tive Value			250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge					-	<						4.09	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			21.14	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 17.53	17.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7]	(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m		_	
39)m= 38.67	38.46	38.25	37.21	37	35.95	35.95	35.75	36.37	37	37.42	37.84]	
Stroma FSAP 201	2 Version	1.0.5.51 ((SAP 9.92)	- http://wv	ww.stroma	.com			Average =	: Sum(39) ₁	12 /12=	37.16	age 2 of 349)

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.58	0.58	0.58	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		
				ı			ı		Average =	: Sum(40) ₁	12 /12=	0.56	(40)
Number of day	1	nth (Tab	le 1a)		1	1		1					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		15		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		5.3		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
		•				•				ım(44) ₁₁₂ =		1023.65	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		_
If instantaneous w	vater heati	ng at point	of use (no	n hot water	storage)	enter () in	hoxes (46		Total = Su	ım(45) ₁₁₂ =		1342.17	(45)
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage		10.04	10.42	13.70	13.0	12.0	14.40	14.03	17.03	10.01	20.21		(40)
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		الممسمام	ft-	مماد الم	/1.\^/1	- /-l-: ·\·							(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	_		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage					Ι			(55) × (41)					(==)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	S. 11	(56)
If cylinder contains									ını where (,HII) IS IIO		хп	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	•	,									0		(58)
Primary circuit				,	•		, ,		(I.	-1-1			
(modified by			ı —		ı —			<u> </u>	1	- 	00.00		(EO)
(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 calculated for each	month (61)m = (60)) ÷ 365 × (41)m			
(61)m= 0 0 0	<u> </u>	0 0 0	0 0	0 0	(61)
Total heat required for water he	eating calculated for	each month (62)m	$= 0.85 \times (45) \text{m} +$	(46)m + (57)m +	· (59)m + (61)m
(62)m= 194.43 171.63 180.87	162.99 160.34 14	4.15 139.29 151.6	3 151.05 168.96	177.59 190.04	(62)
Solar DHW input calculated using App	endix G or Appendix H (r	negative quantity) (enter	'0' if no solar contribu	tion to water heating)	<u>.</u> I
(add additional lines if FGHRS	and/or WWHRS ap	plies, see Appendix	(G)		_
(63)m= 0 0 0	0 0	0 0 0	0 0	0 0	(63)
FHRS 17.95 15.96 16.41	14.51 13.96 12	2.12 11.22 12.87	13.02 15.02	16.24 17.46	(63) (G2)
Output from water heater					_
(64)m= 173.8 153.25 161.77	145.88 143.69 12	9.44 125.38 136.1	3 135.43 151.27	158.76 169.9	
		0	utput from water heate	er (annual) ₁₁₂	1784.71 (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	<u>1</u>]
(65)m= 90.49 80.41 85.98	79.2 79.15 72	2.94 72.15 76.27	75.23 82.02	84.06 89.03	(65)
include (57)m in calculation of	of (65)m only if cylin	der is in the dwellin	g or hot water is f	rom community h	neating
5. Internal gains (see Table 5	and 5a):				
Metabolic gains (Table 5), Wat	ts				_
Jan Feb Mar	Apr May	Jun Jul Aug	Sep Oct	Nov Dec	
(66)m= 107.59 107.59 107.59	107.59 107.59 10	7.59 107.59 107.5	9 107.59 107.59	107.59 107.59	(66)
Ligh <mark>ting g</mark> ains (calcu <mark>lated</mark> in Ap	ppendix L, equation	L9 or L9a), also se	e Table 5		
(67)m= 17.65 15.68 12.75	9.65 7.22 6	.09 6.58 8.56	11.48 14.58	17.02 18.14	(67)
Appliances gains (calculated in	Appendix L, equati	on L13 <mark>or L13a), al</mark>	so see Table 5		
(68)m= 188.39 190.35 185.42	174.93 161.69 14	9.25 140.94 138.9	3 143.91 154.4	167.64 180.08	(68)
Cooking gains (calculated in A	ppendix L, equation	L15 or L15a), also	see Table 5		•
(69)m= 33.76 33.76 33.76	33.76 33.76 33	3.76 33.76 33.76	33.76 33.76	33.76 33.76	(69)
Pumps and fans gains (Table 5	5a)	•	•	•	•
(70)m= 0 0 0	0 0	0 0 0	0 0	0 0	(70)
Losses e.g. evaporation (negat	tive values) (Table 5	5)	•	•	•
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07 -8	6.07 -86.07 -86.0	7 -86.07 -86.07	-86.07 -86.07	(71)
Water heating gains (Table 5)			•	•	•
(72)m= 121.63 119.66 115.56	110 106.39 10	01.3 96.98 102.5	2 104.49 110.25	116.75 119.66	(72)
Total internal gains =		(66)m + (67)m + (68)r	n + (69)m + (70)m + (7	71)m + (72)m	•
(73)m= 382.95 380.96 369.01	349.86 330.58 31	1.92 299.78 305.3	4 315.16 334.5	356.68 373.16	(73)
6. Solar gains:					
Solar gains are calculated using solar	r flux from Table 6a and a	associated equations to	convert to the applica	ble orientation.	
Orientation: Access Factor	Area	Flux	g_ T.L. O	FF	Gains
Table 6d	m²	Table 6a	Table 6b T	able 6c	(W)
North 0.9x 0.77 x	4.8 ×	10.63 ×	0.4 ×	0.7 =	9.9 (74)
North 0.9x 0.77 x	5.44 ×	10.63 ×	0.4 ×	0.7 =	11.22 (74)
North 0.9x 0.77 x	4.8 ×	20.32 ×	0.4 ×	0.7 =	18.93 (74)
North 0.9x 0.77 x	5.44 ×	20.32 ×	0.4 ×	0.7 =	21.45 (74)

N I o mtlo			_						1			- r		_		
North	0.9x	0.77	X	4.8	8	X	3,	4.53	X		0.4] × [0.7	_ =	32.16	(74)
North	0.9x	0.77	X	5.4	14	X	34	4.53	X		0.4	_ x [0.7	_ =	36.45	(74)
North	0.9x	0.77	X	4.8	8	X	5	5.46	X		0.4	_ x [0.7	=	51.66	(74)
North	0.9x	0.77	X	5.4	4	X	5	5.46	X		0.4	×	0.7	=	58.55	(74)
North	0.9x	0.77	X	4.8	8	X	7.	4.72	X		0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	X	5.4	4	X	7-	4.72	X		0.4	x	0.7	=	78.87	(74)
North	0.9x	0.77	X	4.8	8	X	79	9.99	X		0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	5.4	l4	X	79	9.99	X		0.4	x [0.7	=	84.43	(74)
North	0.9x	0.77	X	4.8	8	x	7-	4.68	X		0.4	x [0.7	=	69.55	(74)
North	0.9x	0.77	X	5.4	4	x	7-	4.68	X		0.4	x [0.7	=	78.83	(74)
North	0.9x	0.77	X	4.8	8	x	5	9.25	x		0.4	x [0.7	=	55.18	(74)
North	0.9x	0.77	X	5.4	l4	x	59	9.25	X		0.4	x [0.7	=	62.54	(74)
North	0.9x	0.77	x	4.8	8	x	4	1.52	x		0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	x	5.4	l4	x	4	1.52	X		0.4	x	0.7	<u> </u>	43.82	(74)
North	0.9x	0.77	x	4.8	8	x	24	4.19	x		0.4	ĪxĪ	0.7	=	22.53	(74)
North	0.9x	0.77	x	5.4	ļ4	x	24	4.19	x		0.4	i x	0.7		25.53	(74)
North	0.9x	0.77	X	4.8	8	x	1;	3.12	x		0.4	×	0.7		12.22	(74)
North	0.9x	0.77	x	5.4	14	X	1;	3.12	Х		0.4	х	0.7		13.85	(74)
North	0.9x	0.77	X	4.8	В	х	8	5.86	х		0.4	×	0.7	= -	8.26	(74)
North	0.9x	0.77	X	5.4	l4	х	8	3.86	x		0.4	×	0.7	=	9.36	(74)
East	0.9x	0.77	X	1.4	14	X	19	9.64	X		0.4	x	0.7	_	5.49	(76)
East	0.9x	0.77	Ħ x	1.4	$\overline{}$	X		8.42	X		0.4	X	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.4	\rightarrow	X		3.27	X		0.4	i X	0.7	= =	17.68	(76)
East	0.9x	0.77	×	1.4		X		2.28	X		0.4		0.7	= =	25.78	(76)
East	0.9x	0.77	x	1.4		X		3.09	X		0.4] _x [0.7	╡ .	31.6	(76)
East	0.9x	0.77	×	1.4		x		5.77	X		0.4] _x [0.7	= =	32.35	(76)
East	0.9x	0.77	x	1.4		X		0.22	l X		0.4]	0.7	= =	30.8	(76)
East	0.9x	0.77	×	1.4		x		4.68) X		0.4	」	0.7	= =	26.45	(76)
East	0.9x	0.77	×	1.4		x		3.59	X		0.4]	0.7	= =	20.56	(76)
East	0.9x	0.77	×	1.4		x		5.59	l x		0.4] ^ [] _x [0.7	-	12.74	(76)
East	0.9x	0.77	_ x	1.4		X		4.49	X	_	0.4] ^ [] _x [0.7	= =	6.84	(76)
East	0.9x		=			X			^ x			」^[] _x [= -		(76)
Luot	0.91	0.77	X	1.4	14	^	10	6.15	^		0.4	J ^ L	0.7	=	4.51	(70)
Solar	raine in r	watts, cald	aulatad	for oac	h mani	·h			(93)m	v – Sur	m(74)m	(92)m				
(83)m=	26.62		86.29	135.99	180.00	$\overline{}$	91.28	179.18	144		103.05	60.8	32.91	22.13	1	(83)
		nternal an	d solar						<u> </u>					<u> </u>	J	. ,
(84)m=	409.56		455.3	485.85	510.63	<u> </u>	03.2	478.96	449	.51	418.21	395.3	389.59	395.29	1	(84)
7 Mc	an inter	nal tempe	rature	'hoating	50250	n)					<u> </u>			<u> </u>		
		during he					area f	rom Tah	ole 0	Th1	(°C)				21	(85)
		tor for gai	•			_			טוע אור.	, 1111	(0)					(00)
Otilisa	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	٨	ug	Sep	Oct	Nov	Dec	1	
(86)m=	0.99	0.99	0.96	0.86	0.67	$\overline{}$	0.46	0.33	0.3		0.6	0.89	0.98	0.99	╡	(86)
(50)///-	3.00	0.00	0.00	0.00	0.07			0.00	L	<u>' </u>	0.0	0.00	1 0.00	I 3.33	J	(30)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.62 20.7 20.82 20.95 21 21 21 21 21 20.95 20.78 20.62	ı	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 20.44 20.45 20.45 20.46 20.47 20.48 20.48 20.48 20.48 20.47 20.46 20.46	ı	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.99 0.98 0.96 0.84 0.63 0.42 0.29 0.32 0.55 0.86 0.98 0.99	ı	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 19.94 20.05 20.22 20.41 20.46 20.48 20.48 20.48 20.48 20.41 20.18 19.94	ı	(90)
fLA = Living area ÷ (4) =	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
(92)m= 20.22 20.31 20.47 20.63 20.68 20.69 20.69 20.7 20.69 20.63 20.43 20.22	ı	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 20.22 20.31 20.47 20.63 20.68 20.69 20.69 20.7 20.69 20.63 20.43 20.22	1	(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-calc the utilisation factor for gains using Table 9a	ulate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.98 0.96 0.85 0.65 0.44 0.31 0.34 0.57 0.87 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 405.9 424.91 435.38 411.84 330.15 219.08 147.22 153.57 239.16 344.71 380.02 392.44		(95)
Monthly average external temperature from Table 8		(20)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm, $W = [(39)m \times [(93)m - (96)m]]$ (97)m = 615.66 592.85 534.28 436.6 332.32 219.12 147.22 153.57 239.7 371.18 498.74 606.04		(97)
(97)m= 615.66 592.85 534.28 436.6 332.32 219.12 147.22 153.57 239.7 371.18 498.74 606.04 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		(97)
(98)m= 156.06 112.85 73.58 17.83 1.62 0 0 0 19.69 85.47 158.91	1	
Total per year (kWh/year) = Sum(98) _{15,912} =	626.01	(98)
]
Space heating requirement in kWh/m²/year	9.45	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; the	ne latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers	1	(303a)
Fraction of total space heat from Community boilers (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system](306)
	1.05](300)
Space heating Annual space heating requirement	kWh/year 626.01	1
Author opass houring requirement	020.01	J

Space heat from Community boilers		(98) x (304a) x	(305) x (306) =	657.31	(307a)
Efficiency of secondary/supplementary h	eating system in % (from Tab	ole 4a or Appen	dix E)	0	(308
Space heating requirement from secondary	ary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				1784.71	_
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	1873.94	(310a)
Electricity used for heat distribution	0.	01 × [(307a)(307	(e) + (310a)(310e)] =	25.31	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extract	<u> </u>	le		118.21	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330l	b) + (330g) =	118.21	(331)
Energy for lighting (calculated in Append	ix L)			311.73	(332)
Total delivered energy for all uses (307)	+ (309) + (310) + (312) + (31	5) + (331) + (<mark>3</mark> 3	32)(237b) =	2961.19	(338)
12b. CO2 Emissions – Community heating CO2 from other sources of space and was	E k	nergy Wh/year	Emission factor	r Emissions kg CO2/year	
Efficiency of heat source 1 (%)	ater heating (not CHP) If there is CHP using two fu	els repeat (363) to	(366) for the second fu	uel 95	(367a)
	If there is CHP using two fu	els repeat (363) to x 100 ÷ (367b) x	(366) for the second fu	uel 95 = 575.53	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP using two fu	x 100 ÷ (367b) x		30	
Efficiency of heat source 1 (%) CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0.22	= 575.53	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	[(307b)+(310b)] [(313) x ystems (363)	x 100 ÷ (367b) x (366) + (368)(372	0.22	= 575.53 = 13.14	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy	[(307b)+(310b)] [(313) x vstems (363) (309) x	x 100 ÷ (367b) x (366) + (368)(372	0.22	= 575.53 = 13.14 = 588.66	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second	[(307b)+(310b)] [(313) x vstems (363) ondary) (309) x on heater or instantaneous h	x 100 ÷ (367b) x (366) + (368)(372	0.22 0.52 0	= 575.53 = 13.14 = 588.66 = 0	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second co2 associated with water from immersions)	[(307b)+(310b)] [(313) x vstems (363) ondary) (309) x on heater or instantaneous hater heating (373) +	x 100 ÷ (367b) x (366) + (368)(372 eater (312) x (374) + (375) =	0.22 0.52 0	= 575.53 = 13.14 = 588.66 = 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second co2 associated with water from immersion total CO2 associated with space and water	[(307b)+(310b)] [(313) x (363) (309) x (3	x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) = 31)) x	0.22	= 575.53 = 13.14 = 588.66 = 0 = 0	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second co2 associated with water from immersion total CO2 associated with space and was co2 associated with electricity for pumps co2 associated with electricity for lighting	[(307b)+(310b)] [(313) x ystems (363) ondary) (309) x on heater or instantaneous hater heating (373) + s and fans within dwelling (3	x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) = 31)) x	0.22 0.52 0 0 0.22	= 575.53 = 13.14 = 588.66 = 0 = 0 588.66 = 61.35	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with water from immersi Total CO2 associated with space and wa CO2 associated with electricity for pumps CO2 associated with electricity for lightin Total CO2, kg/year	If there is CHP using two fur [(307b)+(310b)] [(313) x (363) (309) x (309) x (309) x (373) + (373) + (373) x (373) + (373) x (373) + (373) x (373)	x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) = 31)) x	0.22 0.52 0 0 0.22	= 575.53 = 13.14 = 588.66 = 0 = 0 588.66 = 61.35 = 161.79	(367) (372) (373) (374) (375) (376) (378) (379)

		User E	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Proporty	Strom Softwa Address	are Ve	rsion:		Versio	on: 1.0.5.51	
Address :		торену	Address	Sample	e i (iviia))			
1. Overall dwelling dime	nsions:								
0			a(m²)		Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor			66.25	(1a) x		3	(2a) =	198.75	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (66.25	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	198.75	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0] = [0	X	20 =	0	(6b)
Number of intermittent fa	ns	_		Ī	2	X	10 =	20	(7a)
Number of passive vents				Ē	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X	40 =	0	(7c)
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)$				20		÷ (5) =	0.1	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, proced	ed to (17),	otherwise (continue fr	om (9) to ((16)		0	7 (0)
Additional infiltration	ie dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction			0	(11)
	resent, use the value corresponding t	to the grea	ter wall are	a (after					
deducting areas of openir	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or () 1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, en	,	7.1 (ocan	<i>5a)</i> , 0100	critor o				0	(13)
	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	-	•	•	etre of e	envelope	area	5	(17)
·	ity value, then $(18) = [(17) \div 20] +$. , .	,		0.35	(18)
Number of sides sheltere	s if a pressurisation test has been do d	ne or a de	gree air pe	rmeability	is being u	sed		2	(19)
Shelter factor	.		(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
. ,				<u> </u>	L	Ц		J	

Adjusted infiltration rate (allo	wing for shelter a	and wind st	need) =	(21a) x	(22a)m					
0.38 0.37 0.37		0.28	0.28	0.28	0.3	0.32	0.34	0.35		
Calculate effective air chang		licable cas	se							
If mechanical ventilation:									0	(23a)
If exhaust air heat pump using Ap) = (23a)			0	(23b)
If balanced with heat recovery: e	ficiency in % allowing	g for in-use fa	actor (from	n Table 4h) =				0	(23c)
a) If balanced mechanical			• (- ` ` - 	ŕ	, 		```	÷ 100]	(a.)
(24a)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical	i i		• •	<u> </u>	í `	r ´ `	- 		1	(0.41)
(24b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract v if (22b)m < 0.5 × (23b)	•	•				.5 × (23b	o)		_	
(24c)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or v if (22b)m = 1, then (24	•					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 (24	4b) or (24c	c) or (24	d) 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 los	s parameter:							_	_	
ELEMENT Gross area (m²)	Openings m ²	Net Are A ,m		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
Doors		2.4	x	1	=	2.4	$\stackrel{'}{\sqcap}$			(26)
Windows Type 1		4.8	x1/	/[1/(1.4)+	0.04] =	6.36	Ħ			(27)
Windows Type 2		5.44	x1/	/[1/(1.4)+	0.04] =	7.21	Ħ			(27)
Windows Type 3		1.44	x1/	/[1/(1.4)+	0.04] =	1.91				(27)
Walls Type1 10.24	10.24	0	x	0.18	=	0				(29)
Walls Type2 1.44	1.44	0	x	0.18	<u> </u>	0	$\overline{}$		$\exists \ $	(29)
Walls Type3 13.2	2.4	10.8	x	0.18	=	1.94				(29)
Walls Type4 2.4	0	2.4	x	0.18	=	0.43				(29)
Total area of elements, m ²		27.28								(31)
* for windows and roof windows, us ** include the areas on both sides o			ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric heat loss, W/K = S (A	x U)			(26)(30)) + (32) =				20.26	(33)
Heat capacity Cm = S(A x k)				((28).	(30) + (32	2) + (32a).	(32e) =	184.8	(34)
Thermal mass parameter (TI	MP = Cm ÷ TFA)	in kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assessments where the can be used instead of a detailed can		ction are not	known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridges : S (L x Y) o	alculated using A	Appendix K	(1.36	(36)
if details of thermal bridging are not Total fabric heat loss	known (36) = 0.05 x	(31)			(33) +	(36) =			21.62	(37)
Ventilation heat loss calculat	ed monthly				(38)m	= 0.33 × ((25)m x (5))		
Jan Feb Ma	r Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 37.53 37.35 37.16	36.32 36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38)
Heat transfer coefficient, W/k	((39)m	= (37) + (37)	38)m			
(39)m= 59.15 58.97 58.79	57.94 57.78	57.05	57.05	56.91	57.33	57.78	58.11	58.44	<u> </u>	
Stroma FSAP 2012 Version: 1.0.5.5	1 (SAP 9.92) - http://	www.stroma.	com			Average =	Sum(39) ₁	12 /12=	57.9 ≱ a	age 2 of 3 9)

Heat loss para	ameter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.89	0.89	0.89	0.87	0.87	0.86	0.86	0.86	0.87	0.87	0.88	0.88		
	!	<u> </u>			<u> </u>	<u>I</u>	<u> </u>		Average =	Sum(40) ₁ .	12 /12=	0.87	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occi			[4	/ o oooo	140 /TF	- 400	\0\1 · 0 /	2042 /	TEA 40		15		(42)
if TFA > 13. if TFA £ 13.		+ 1.76 X	[1 - exp	(-0.0003	349 X (11	-A -13.9)2)] + 0.0	J013 X (IFA -13.	.9)			
Annual average	•	ater usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		85	5.3		(43)
Reduce the annu-	•		• .		-	-	to achieve	a water us	se target o				, ,
not more that 125	litres per l	person per	day (all w	ater use, I	not and co	la)						ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
_					400 1//	_	- (ooo			m(44) ₁₁₂ =		1023.65	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x L	01m/3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
If instantaneous	votor hosti	ng at paint	of upo (no	hot water	r otorogo)	ontor () in	haves (16		Total = Su	m(45) ₁₁₂ =	=	1342.17	(45)
If instantaneous v						_							
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage Storage volum		includin	na any sa	olar or M	/M/HRS	storage	within s	ame ves	ച		450		(47)
								arric ves.	301		150		(47)
If community hotherwise if no	_			_				ers) ente	er 'Ω' in <i>(</i>	47)			
Water storage		not wate	71 (tillo III	1014400 1	notantai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	010) 01110	31 O III (,			
a) If manufac		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b			- ,					54		(49)
Energy lost fro				ear			(48) x (49)) =			75		(50)
b) If manufac		_	-		or is not			,		0.			(55)
Hot water stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3									•	
Volume factor											0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33		00.00	00.50	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
` '	21.07	23.33	22.58	20.00									(37)
		<u> </u>					<u>I</u>		!		0		(58)
Primary circuit	loss (ar	nnual) fro	m Table	3		<u> </u>	65 × (41)	ım	•		0		, ,
Primary circuit	loss (ar loss cal	nnual) fro culated f	m Table for each	3 month (59)m = ((58) ÷ 36	, ,		r thermo		0		, ,

Combi lo	ss 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 hea	at requ	ired for	water he	eating ca	alculated	for eacl	n month	(62)m	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 18	85.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		(62)
Solar DHW	input c	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribut	ion to wate	er heating)	J	
(add addi	itional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendi	x G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output fro	om wa	iter hea	ter											
(64)m= 18	85.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		_
						-	-	0	output from w	ater heate	r (annual)₁	12	1890.79	(64)
Heat gair	ns fron	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 8	33.54	74.14	79.03	72.48	72.21	66.22	65.21	69.33	3 68.51	75.08	77.34	82.08		(65)
include	e (57)n	n in calc	culation of	of (65)m	only if c	ylinder is	s in the o	dwellir	ng or hot w	ater is f	om com	munity h	eating	
5. Interi	nal ga	ins (see	Table 5	and 5a)):									
Metabolio	c gains	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 10	07.59	107.59	107.59	107.59	107.59	107.59	107.59	107.5	107.59	107.59	107.59	107.59		(66)
ا Ligh <mark>ting و</mark>	gains (calculat	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso se	e Table 5					
(67)m= 1	17.21	15.29	12.43	9.41	7.04	5.94	6.42	8.34	11.2	14.22	16.59	17.69		(67)
Appliance	es gaiı	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ıble <mark>5</mark>			'	
(68)m= 18	88.39	190.35	185.42	174.93	161.69	149.25	140.94	138.9	143.91	154.4	167.64	180.08		(68)
Cooking	gains	(calcula	ted in A	pendix	L, equa	tion L15	or L15a)	, also	see Table	5		•	'	
(69)m= 3	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	6 33.76	33.76	33.76	33.76		(69)
Pumps a	nd fan	s gains	(Table 5	 ia)		•		•	•	•	•	•	ı	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e	g. eva	aporatio	n (negat	ive valu	es) (Tab	le 5)			•	•	•		ı	
(71)m= -8	86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.0	7 -86.07	-86.07	-86.07	-86.07		(71)
Water he	eating	gains (T	able 5)							· ·		Į.	I	
_		110.32	106.23	100.67	97.05	91.97	87.65	93.18	95.15	100.91	107.41	110.33		(72)
Total into	ernal	gains =				(66)	m + (67)m	ı + (68)ı	m + (69)m +	(70)m + (7	(1)m + (72)	m	I	
_	76.17	374.23	362.36	343.29	324.06	305.44	293.28	298.7	9 308.54	327.8	349.92	366.38		(73)
6. Solar	gains													
Solar gain	ns are ca	alculated	using sola	r flux from	Table 6a	and associ	ated equa	tions to	convert to the	ne applicat	ole orientat	ion.		
Orientation			actor	Area		Flu			g_		FF		Gains	
	T	able 6d		m²		Tal	ole 6a		Table 6b	Т	able 6c		(W)	
North	0.9x	0.77	X	4.8	3	x 1	0.63	x	0.63	X	0.7	=	15.6	(74)
North	0.9x	0.77	X	5.4	4	x 1	0.63	x	0.63	X	0.7	=	17.68	(74)
North	0.9x	0.77	X	4.8	3	x 2	0.32	x	0.63	X	0.7	=	29.81	(74)
North	0.9x	0.77	х	5.4	4	x 2	0.32	x	0.63	x	0.7	=	33.78	(74)

N 1 41	-												_				
North	0.9x	0.77		X	4.8		X	34	4.53	X		0.63	X	0.7	=	50.65	(74)
North	0.9x	0.77		X	5.44		X	3.	4.53	X		0.63	X	0.7	=	57.41	(74)
North	0.9x	0.77		X	4.8		X	5	5.46	X		0.63	X	0.7	=	81.36	(74)
North	0.9x	0.77		X	5.44		X	5	5.46	X		0.63	X	0.7	=	92.21	(74)
North	0.9x	0.77		X	4.8		X	7	4.72	X		0.63	X	0.7	=	109.6	(74)
North	0.9x	0.77		X	5.44		X	7-	4.72	X		0.63	X	0.7	=	124.22	(74)
North	0.9x	0.77		X	4.8		X	7:	9.99	X		0.63	X	0.7	=	117.33	(74)
North	0.9x	0.77		X	5.44		X	79	9.99	X		0.63	X	0.7	=	132.98	(74)
North	0.9x	0.77		x	4.8		x	74	4.68	X		0.63	X	0.7	=	109.55	(74)
North	0.9x	0.77		X	5.44		X	7-	4.68	X		0.63	X	0.7	=	124.15	(74)
North	0.9x	0.77		X	4.8		x	5	9.25	X		0.63	X	0.7	=	86.91	(74)
North	0.9x	0.77		X	5.44		x	5	9.25	x		0.63	X	0.7	=	98.5	(74)
North	0.9x	0.77		X	4.8		x	4	1.52	X		0.63	×	0.7	=	60.9	(74)
North	0.9x	0.77		X	5.44		x	4	1.52	X		0.63	x	0.7	=	69.02	(74)
North	0.9x	0.77		X	4.8		x	24	4.19	X		0.63	x	0.7	=	35.48	(74)
North	0.9x	0.77		X	5.44		x	24	4.19	x		0.63	×	0.7	=	40.22	(74)
North	0.9x	0.77		X	4.8		x	1;	3.12	X		0.63	x	0.7	=	19.24	(74)
North	0.9x	0.77		X	5.44		X	1;	3.12	Х		0.63	X	0.7	=	21.81	(74)
North	0.9x	0.77		X	4.8		х	8	3.86	х		0.63	x	0.7		13	(74)
North	0.9x	0.77		x	5.44		х	8	3.86	x		0.63	x	0.7	=	14.74	(74)
East	0.9x	0.77		X	1.44		X	19	9.64	X		0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77		X	1.44		x	38	8.42	Х		0.63	x	0.7		16.91	(76)
East	0.9x	0.77		X	1.44	7	x	6:	3.27	Х		0.63	x	0.7	_ =	27.85	(76)
East	0.9x	0.77		X	1.44		х	9:	2.28	x		0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77		x	1.44		x	11	3.09	x		0.63	х	0.7	_ =	49.77	(76)
East	0.9x	0.77		X	1.44		x	11	5.77	X		0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77		X	1.44		x	11	0.22	X		0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77		X	1.44		x	9,	4.68	x		0.63	×	0.7	=	41.67	(76)
East	0.9x	0.77		X	1.44		x	7:	3.59	X		0.63	x	0.7	=	32.39	(76)
East	0.9x	0.77		X	1.44		x	4	5.59	x		0.63	×	0.7	=	20.06	(76)
East	0.9x	0.77		X	1.44		x	24	4.49	x		0.63	×	0.7		10.78	(76)
East	0.9x	0.77		X	1.44		x	10	6.15	x		0.63	x	0.7	=	7.11	(76)
	_																
Solar	gains in	watts, ca	lculat	ed	for each	mont	h			(83)m	ı = Su	ım(74)m .	(82)m			_	
(83)m=	41.92	80.5	135.9	1	214.19	283.59	3	01.26	282.2	227	.08	162.31	95.76	51.83	34.85		(83)
Total g	ains – ii	nternal a	nd sol	lar	(84)m = 0	(73)m	1 + (8	33)m ,	watts								
(84)m=	418.09	454.73	498.2	7	557.47	607.65	6	06.7	575.48	525	.86	470.85	423.5	7 401.75	401.22]	(84)
7. Me	an inter	nal temp	eratur	·е (heating s	easo	n)										
Temp	erature	during h	eating	j pe	eriods in 1	the liv	/ing	area f	rom Tab	ole 9,	, Th1	I (°C)				21	(85)
Utilisa	ation fac	tor for ga	ains fo	r li	ving area	, h1,ı	n (s	ee Tal	ble 9a)								
	Jan	Feb	Ма	r	Apr	May	, <u> </u>	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98		0.94	0.8		0.59	0.43	0.4	19	0.78	0.96	0.99	1		(86)
																=	

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.15 20.26 20.46 20.74 20.93 20.99 21 21 20.96 20.71 20.39 20.13 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.17 20.18 20.18 20.19 20.19 20.2 20.2 20.2 20.2 20.19 20.19 20.18 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90) fLA = Living area ÷ (4) = 0.41 (91)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.17 20.18 20.18 20.19 20.19 20.2 20.2 20.2 20.2 20.19 20.19 20.18 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(88)m= 20.17 20.18 20.18 20.19 20.19 20.2 20.2 20.2 20.19 20.19 20.19 20.18 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.16 19.86 19.4 19.02 (90)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.16 19.86 19.4 19.02 (90)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$
(92)m= 19.49 19.63 19.89 20.23 20.45 20.52 20.53 20.49 20.21 19.8 19.48 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate
(93)m= 19.49 19.63 19.89 20.23 20.45 20.52 20.53 20.49 20.21 19.8 19.48 (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=
Useful gains, hmGm, $W = (94)m \times (84)m$ $(95)m = 416.12 \ 450.79 \ 487.2 \ 514.37 \ 469.72 \ 334.2 \ 223.76 \ 234.19 \ 346.69 \ 402.44 \ 397.68 \ 399.73$ (95)
Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m–(96)m]]
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(98)m= 359.08 280.92 223.13 102.45 26.86 0 0 0 113.72 245.16 366.77
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1718.09 (98)
Space heating requirement in kWh/m²/year 25.93 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (201)
Fraction of space heat from main system(s) $(202) = 1 - (201) = 1$ (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1
Efficiency of secondary/supplementary heating system, % 0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)
359.08 280.92 223.13 102.45 26.86 0 0 0 113.72 245.16 366.77
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211)
384.04 300.45 238.64 109.57 28.73 0 0 0 121.62 262.2 392.27
Total (kWh/year) =Sum(211) _{15,1012} = 1837.53 (211)

Space heating fuel (secondary), kWh/month									
$= \{[(98)m \times (201)]\} \times 100 \div (208)$									
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		
,		_	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	_	0	(215)
Water heating									
Output from water heater (calculated above) 185.75 163.79 172.18 154.58 151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		
Efficiency of water heater	135.75	130.6	143	142.64	160.28	169.19	181.36	70.0	(216)
(217)m= 86.54 86.24 85.51 83.75 81.25	79.8	79.8	79.8	79.8	83.92	85.8	86.66	79.8	(217)
Fuel for water heating, kWh/month	70.0	70.0	70.0	70.0	00.02	00.0	00.00		(=,
(219) m = (64) m x $100 \div (217)$ m								ı	
(219)m= 214.63 189.92 201.37 184.58 186.66	170.11	163.66	179.19	178.75	191	197.19	209.29		_
			Tota	I = Sum(2				2266.36	(219)
Annual totals					k\	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1								1837.53	╡
Water heating fuel used								2266.36	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
boi <mark>ler with a fan-ass</mark> isted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								303.98	(232)
Total delivered energy for all uses (211)(221)	+ (231)	+ (232).	(237b)	=				4482.87	(338)
12a. CO2 emissions – Individual heating syste	ms inclu	uding mi	cro-CHP						
	En	ergy			Emiss kg CO	ion fac	tor	Emissions	
Occasion to active (mails as atom 4)		/h/year					ı		_
Space heating (main system 1)		1) x			0.2	16	=	396.91	(261)
Space heating (secondary)	(215	5) x			0.5	19	=	0	(263)
Water heating	(219	9) x			0.2	16	=	489.53	(264)
Space and water heating	(261	1) + (262)	+ (263) + (264) =				886.44	(265)
Electricity for pumps, fans and electric keep-hot	(231	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232	2) x			0.5	19	=	157.76	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1083.13	(272)
							1		_

TER =

(273)

16.35

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height:

66.25 m² Floor 0 3 m

27.2 m² (fraction 0.411) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
DOO	R	<u>Manuf</u> actur <mark>e</mark>	er Solid			Wood
W		Manufacture	er Windows	low-E, $En = 0.05$, s	<mark>soft</mark> coat No	
N		Manufacture	er Windows	low-E, $En = 0.05$, s	soft coat No	
Balco	ony	Manufacture	er Windows	low-E, En = 0.05 , s	<mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
N		0.7	0.4	1	10.24	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
N		N	North	0	0
Balcony		N	North	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>'S</u>						
N	31.8	15.04	16.76	0.15	0	False	N/A
W	18.75	1.44	17.31	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20			Strom Softwa	are Ve	rsion:		Versio	on: 1.0.5.51	
		Р	roperty	Address	Sample	e 2 (Mid)			
Address: 1. Overall dwelling dime	oncione:									
1. Overall dwelling diffe	F1310113.		Δre	a(m²)		Δv He	eight(m)		Volume(m	3)
Ground floor					(1a) x	Av. He	3	(2a) =	198.75	(3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(*	1e)+ (1r	n)	66.25	(4)			J` ′		
Dwelling volume	۵,۰(۱۵,۰(۱۵,۰(۱۵,۰		.,	00.23)+(3c)+(3c	d)+(3e)+	(3n) =	400.75	
					(00)1(00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	u)	(011) =	198.75	(5)
2. Ventilation rate:	main	secondai	v	other		total			m³ per hou	ır
Number of chimneys	heating	heating	, 기 + ୮		7 = F			40 =		
,		0	╛╘	0	╛╘	0			0	(6a)
Number of open flues	0 +	0	_	0] = [0		20 =	0	(6b)
Number of intermittent fa	ins					0	X	10 =	0	(7a
Number of passive vents						0	X	10 =	0	(7 b)
Number of flueless gas f	ires					0	X	40 =	0	(7c
					_			A 1		
					_		<u> </u>	Air cr	nanges per h	our —
Infiltration due to chimne						0		\div (5) =	0	(8)
If a pressurisation test has be Number of storeys in t		iaea, procee	a to (17), (otnerwise (continue fi	rom (9) to	(16)		0	(9)
Additional infiltration	is all simily (ris)						[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0	.25 for steel or timbe	er frame or	0.35 fo	r masoni	y const	ruction			0	(11
	resent, use the value corre	esponding to	the great	ter wall are	a (after					
deducting areas of openial If suspended wooden to	• / .	aled) or 0	1 (seale	ad) else	enter ()				0	(12
If no draught lobby, en	,	•	i (ocaic	<i>Ju)</i> , 0100	Citici o				0	(13
Percentage of window	•								0	(14
Window infiltration	5	• •		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16
Air permeability value,	q50, expressed in co	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17
If based on air permeabi	-								0.15	(18
Air permeability value applie		nas been dor	ne or a de	gree air pe	rmeability	is being u	ised		<u> </u>	<u> </u>
Number of sides sheltere Shelter factor	; a			(20) = 1 -	0.075 x (19)] =			0.85	(19
Infiltration rate incorpora	ting shelter factor			(21) = (18		- /1			0.83	(21
Infiltration rate modified f	-	ed		() (-)	(-)				0.13	(21
Jan Feb	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp	1	<u> </u>	L	1		1	1	1	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
· · <u> </u>			I	1	<u> </u>	1	1	1	J	
Wind Factor (22a)m = (2	2)m ÷ 4		ı	·					1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		_	rate for t	he appli	cable ca	se	l				!	, 	
If mechanica			l' N. (0	01) (00	/	(1	15// (1	. (00)) (OO)			0.5	(238
If exhaust air h									o) = (23a)			0.5	(23b
If balanced with		•	-	_								79.05	(230
a) If balance						<u> </u>	- ` ` - 	ŕ	- 		- ` 	i ÷ 100] I	(246
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24a
b) If balance							r ``	i `	 	- 	Ι ,	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h				•	•				.5 × (23b	p)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and he	eat loss	paramete	er:								_	
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1.4	=	3.36				(26)
Win <mark>dows</mark> Type	1				1.44	×	1/[1/(1)+	0.04] =	1.38	Ħ			(27)
Windows Type	2				10.24	X	1/[1/(1)+	0.04] =	9.85	Ħ			(27)
Windows Type	3				4.8	x	1/[1/(1)+	0.04] =	4.62	5			(27)
Walls Type1	31.	8	15.04	1	16.76	x	0.15		2.51				(29)
Walls Type2	18.7	' 5	1.44		17.31	x	0.15		2.6			7 F	(29)
Walls Type3	11.	1	2.4		8.7	x	0.15	=	1.3	F i			(29)
Walls Type4	2.4		0	=	2.4	X	0.35	=	0.84	=		5 H	(29)
Total area of e	L	i			64.05								(31)
* for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	1 3.2	,
** include the area	as on both	sides of in	nternal wal	s and part	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				26.46	(33)
Heat capacity		,						((28).	(30) + (32	2) + (32a).	(32e) =	632.38	(34)
Thermal mass	•	`		,					tive Value			250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge					-	<						9.61	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			36.07	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 17.53	17.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7		(38)
Heat transfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 53.6	53.39	53.18	52.14	51.93	50.88	50.88	50.67	51.3	51.93	52.34	52.76		
Stroma FSAP 201	2 Version	1.0.5.51 ((SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	52.0β	age 2 of 349)

eat lo	ss para	meter (H	ILP), W/	m²K			•	•	(40)m	= (39)m ÷	(4)			
0)m=	0.81	0.81	0.8	0.79	0.78	0.77	0.77	0.76	0.77	0.78	0.79	0.8		
umba	or of dov	o in mar	sth (Tabl	lo 1o)					,	Average =	Sum(40) ₁ .	12 /12=	0.79	(4
umbe	Jan	s in mor Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
.,	<u> </u>		0.	00	0.			.				<u> </u>		•
1. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssum	ed occu	pancy, N	N								2.	15		(4
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	9)			
nnua	l averag	e hot wa						(25 x N)				5.3		(4
		ll average litres per p				_	_	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate		n litres per							СОР		1101			
4)m=	93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
							·			Total = Su			1023.65	(
								Tm / 3600						
5)m=	139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		— ,
nstanı	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =		1342.17	(
6)m=	2 0.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(
ater	storage	loss:								<u> </u>		<u> </u>		
torag	e volum	e (litres)	includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(
	•	eating a			_			' '		(O) : (47)			
	vise ii no storage		not wate	er (unis iri	iciudes i	nstantar	ieous co	mbi boil	ers) erite	er o in (47)			
	•	urer's de	eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(
empe	erature fa	actor fro	m Table	2b								0		(
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(
		urer's de		-										
		age loss eating s			e 2 (kW	h/litre/da	ıy)				0.	.02		(
	-	from Tal		JII 4.J							1	.03		(
		actor fro		2b								.6		(
nera\	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		03		(
٠.		54) in (5	•	,								03		(
ater	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
6)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
		dedicated	d solar sto			x [(50) – (7)m = (56)	m where (H11) is fro	m Appendi	x H	
7)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
imar	y circuit	loss (an	nual) fro	m Table	3							0		(
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
IIIIai					•		. ,	, ,						
	dified by	factor fr	om Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			

Combi loss calculated for eac	h month (61)m =	: (60) ÷ 365 × (4	1)m						
(61)m= 0 0 0	0 0	0 0	0	0	0	0	0		(61)
Total heat required for water I	neating calculate	d for each mont	h (62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.43 171.63 180.87	162.99 160.34	144.15 139.29	151.68	151.05	168.96	177.59	190.04		(62)
Solar DHW input calculated using Ap	pendix G or Append	x H (negative quant	ity) (enter '0)' if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines if FGHR	S and/or WWHR	S applies, see A	ppendix (G)					
(63)m= 0 0 0	0 0	0 0	0	0	0	0	0		(63)
FHRS 17.95 15.96 16.41	14.51 13.96	12.12 11.22	12.87	13.02	15.02	16.24	17.46		(63) (G2)
Output from water heater								_	
(64)m= 173.8 153.25 161.77	145.88 143.69	129.44 125.38	136.13	135.43	151.27	158.76	169.9		_
			Out	put from wa	ater heate	r (annual)₁	12	1784.71	(64)
Heat gains from water heating	g, kWh/month 0.2	25 ´ [0.85 × (45)	m + (61)n	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m= 90.49 80.41 85.98	79.2 79.15	72.94 72.15	76.27	75.23	82.02	84.06	89.03		(65)
include (57)m in calculation	of (65)m only if	cylinder is in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gains (see Table	5 and 5a):								
Metabolic gains (Table 5), Wa	atts							_	
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 107.59 107.59 107.59	107.59 107.59	107.59 107.59	107.59	107.59	107.59	107.59	107.59		(66)
Lighting gains (calculated in A	A <mark>ppen</mark> dix L, equ <mark>a</mark>	tion L9 or L9a),	also see	Table 5					
(67)m= 16.81 14.93 12.14	9.19 6.87	5.8 6.27	8.15	10.93	13.88	16.2	17.27		(67)
Appliances gains (calculated	in Appendix L, e	quation L13 or L	13a), also	see Tal	ble 5				
(68)m= 188.39 190.35 185.42	174.93 161.69	149.25 140.94	138.98	143.91	154.4	167.64	180.08		(68)
Cooking gains (calculated in A	A <mark>ppen</mark> dix L, equa	ation L15 or L15	a), also s	ee Table	5				
(69)m= 33.76 33.76 33.76	33.76 33.76	33.76 33.76	33.76	33.76	33.76	33.76	33.76		(69)
Pumps and fans gains (Table	5a)	•	-	•				•	
(70)m= 0 0 0	0 0	0 0	0	0	0	0	0		(70)
Losses e.g. evaporation (neg	ative values) (Ta	ble 5)	•	•				•	
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07	-86.07	-86.07	-86.07	-86.07		(71)
Water heating gains (Table 5))	•	•					•	
(72)m= 121.63 119.66 115.56	110 106.39	101.3 96.98	102.52	104.49	110.25	116.75	119.66		(72)
Total internal gains =		(66)m + (67)	m + (68)m	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m= 382.1 380.21 368.4	349.4 330.23	311.63 299.46	304.93	314.61	333.8	355.86	372.29		(73)
6. Solar gains:			•						
Solar gains are calculated using so	ar flux from Table 6a	and associated equ	uations to co	onvert to th	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux	_	g_ -	_	FF		Gains	
Table 6d	m²	Table 6a	_	able 6b		able 6c		(W)	_
North 0.9x 0.77	x 10.24	x 10.63	x	0.4	x	0.7	=	21.13	(74)
North 0.9x 0.77	X 4.8	x 10.63	x	0.4	x	0.7	=	9.9	(74)
North 0.9x 0.77	x 10.24	x 20.32	x	0.4	x	0.7	=	40.38	(74)
North 0.9x 0.77	X 4.8	x 20.32	X	0.4	x	0.7	=	18.93	(74)

	_		_		_			_						_
North	0.9x	0.77	X	10.24	X	34.53		X	0.4	x	0.7	=	68.61	(74)
North	0.9x	0.77	X	4.8	X	34.53		X	0.4	x	0.7	=	32.16	(74)
North	0.9x	0.77	X	10.24	X	55.46		X	0.4	x	0.7	=	110.21	(74)
North	0.9x	0.77	X	4.8	X	55.46		X	0.4	x	0.7	=	51.66	(74)
North	0.9x	0.77	X	10.24	X	74.72		X	0.4	x	0.7	=	148.46	(74)
North	0.9x	0.77	X	4.8	X	74.72		X	0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	X	10.24	X	79.99		X	0.4	x	0.7	=	158.93	(74)
North	0.9x	0.77	X	4.8	X	79.99		x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	10.24	X	74.68		x	0.4	x	0.7	=	148.38	(74)
North	0.9x	0.77	X	4.8	X	74.68		X	0.4	x	0.7	=	69.55	(74)
North	0.9x	0.77	X	10.24	X	59.25		x	0.4	x	0.7	=	117.72	(74)
North	0.9x	0.77	X	4.8	X	59.25		X	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	X	10.24	X	41.52		X	0.4	x [0.7	=	82.49	(74)
North	0.9x	0.77	X	4.8	X	41.52		X	0.4	х	0.7	=	38.67	(74)
North	0.9x	0.77	X	10.24	X	24.19		X	0.4	х	0.7	=	48.06	(74)
North	0.9x	0.77	X	4.8	X	24.19		x	0.4	x	0.7	=	22.53	(74)
North	0.9x	0.77	X	10.24	X	13.12		X	0.4	x	0.7	=	26.06	(74)
North	0.9x	0.77	X	4.8	X	13.12		X	0.4	Х	0.7	=	12.22	(74)
North	0.9x	0.77	X	10.24	Х	8.86		x	0.4	x	0.7	=	17.61	(74)
North	0.9x	0.77	x	4.8	X	8.86		×	0.4	x	0.7	=	8.26	(74)
West	0.9x	0.77	X	1.44	X	19.64		x	0.4	x	0.7	=	5.49	(80)
West	0.9x	0.77	x	1.44	X	38.42		Х	0.4	x	0.7	=	10.74	(80)
West	0.9x	0.77	x	1.44	X	63.27		X	0.4	x	0.7	=	17.68	(80)
West	0.9x	0.77	X	1.44	X	92.28		x	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	X	1.44	X	113.09		x	0.4	x	0.7	=	31.6	(80)
West	0.9x	0.77	X	1.44	X	115.77		X	0.4	х	0.7	=	32.35	(80)
West	0.9x	0.77	X	1.44	X	110.22		x	0.4	x	0.7	=	30.8	(80)
West	0.9x	0.77	X	1.44	X	94.68		x	0.4	x	0.7	=	26.45	(80)
West	0.9x	0.77	X	1.44	X	73.59		X	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	X	1.44	X	45.59		X	0.4	x [0.7	=	12.74	(80)
West	0.9x	0.77	X	1.44	X	24.49		x	0.4	x [0.7	=	6.84	(80)
West	0.9x	0.77	X	1.44	X	16.15		x	0.4	x	0.7	=	4.51	(80)
Ť		watts, calc	ulated	for each mo	_			3)m =	Sum(74)m .	(82)m		,		
(83)m=	36.52	<u> </u>	18.45	187.65 249.		65.77 248		199.36	141.72	83.33	45.12	30.38		(83)
Ī				(84)m = (73)										
(84)m=	418.62	450.25 4	186.85	537.05 579.	88 5	77.41 548	.19 5	504.28	456.33	417.14	400.99	402.68		(84)
7. Mea	an inter	nal temper	rature (heating seas	on)									
Tempe	erature	during hea	ating pe	eriods in the	living	area from	Table	9, T	h1 (°C)				21	(85)
Utilisa <u>-</u>	tion fac	tor for gair	ns for li	ving area, h1	,m (s	ee Table 9	9a) <u> </u>							
	Jan	Feb	Mar	Apr Ma	ау	Jun Ju	ال	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93 0.7	3	0.56 0.4	11	0.46	0.74	0.96	0.99	1		(86)
_														

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 20.28 20.38 20.56 20.8 20.95 21 21 21 20.98 20.79 20.5 20.27	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	,
(88)m= 20.25 20.25 20.25 20.26 20.27 20.28 20.28 20.28 20.28 20.27 20.26 20.26	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	-
(89)m= 1 0.99 0.98 0.91 0.73 0.5 0.34 0.39 0.68 0.94 0.99 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	-
(90)m= 19.28 19.42 19.69 20.04 20.23 20.28 20.28 20.28 20.26 20.02 19.61 19.27	(90)
fLA = Living area ÷ (4) =	0.41 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 19.69 19.81 20.04 20.35 20.52 20.57 20.58 20.58 20.55 20.34 19.98 19.68	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_
(93)m= 19.69 19.81 20.04 20.35 20.52 20.57 20.58 20.58 20.55 20.34 19.98 19.68	(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 utilisation factor for gains using Table 9a	culate _
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 0.99 0.99 0.98 0.91 0.75 0.52 0.37 0.42 0.7 0.94 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	1 (05)
(95)m= 416.45 446.01 475.15 491.04 435.85 302.33 202.19 211.41 320.54 392.38 396.3 401.02	(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	7 (96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ m – (96) m $]$] (90)
(97)m= 824.75 796.27 720.24 596.98 458.24 303.92 202.31 211.68 331.02 505.52 674.04 816.61] (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m] ` ′
(98)m= 303.78 235.37 182.35 76.28 16.66 0 0 0 0 84.18 199.97 309.2	1
Total per year (kWh/year) = Sum(98) _{15,912} =	1407.78 (98)
Space heating requirement in kWh/m²/year	21.25 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community scheme.	
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	the latter
Fraction of heat from Community boilers	1 (303a
Fraction of total space heat from Community boilers (302) x (303a) =	1 (304a
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	1407.78

Space heat from Community boilers		(98) x (304a) x	(305) x (306) =	1478.17	(307a)
Efficiency of secondary/supplementary h	eating system in % (fron			0](308
Space heating requirement from secondary		• •	,	0](309)
	ary/supplementary syste	(50) x (50) x 1	. (666) =	0](000)
Water heating Annual water heating requirement				1784.71	1
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	1873.94	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	33.52	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extract		outside		118.21	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	118.21	(331)
Energy for lighting (calculated in Append	ix L)			296.83	(332)
Total delivered energy for all uses (307)	+ (309) + (310) + (312) -	+ (315) + (331) + (33	32) (237h) -	3767.14	(338)
Total don voice onergy for all doos (667)	(000) (010) (012)	(010) ((001) ((00	02)(2370) =	0/0/.14	(000)
12b. CO2 Emissions – Community heating	ng scheme	Energy kWh/year	Emission factor		(000)
	ng scheme ater heating (not CHP)	Energy	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating CO2 from other sources of space and was	ng scheme ater heating (not CHP) If there is CHP using	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and was Efficiency of heat source 1 (%)	ng scheme ater heating (not CHP) If there is CHP using [(307b)+(3	Energy kWh/year two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year](367a)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1	ng scheme ater heating (not CHP) If there is CHP using [(307b)+(3	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	Emissions kg CO2/year 95 762.16](367a)](367)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	ng scheme Atter heating (not CHP) If there is CHP using [(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	Emissions kg CO2/year 95 762.16](367a)](367)](372)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy	ng scheme ater heating (not CHP) If there is CHP using [(307b)+(3) restems (3) (3)	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	95 762.16 17.4 779.56](367a)](367)](372)](373)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second	ng scheme ater heating (not CHP) If there is CHP using [(307b)+(3) restems ondary) (3) on heater or instantance	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	95 762.16 17.4 779.56](367a)](367)](372)](373)](374)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second community sy co2 associated with water from immersions)	restems (307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x (309) x (313) x (313) x (313) x (313) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	95 762.16 17.4 779.56](367a)](367)](372)](373)](374)](375)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (second co2 associated with water from immersion total CO2 associated with space and was compared to the control of the	ater heating (not CHP) If there is CHP using [(307b)+(3) [(307b)+(3)	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372 (309) x (309) x (313) x (313) x (313) x (313) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 =	95 762.16 17.4 779.56 0 779.56 61.35](367a)](367)](372)](373)](374)](375)](376)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second cost of the cost of	ater heating (not CHP) If there is CHP using [(307b)+(3) [(307b)+(3)	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x 363)(366) + (368)(372 309) x bus heater (312) x 373) + (374) + (375) = ng (331)) x	Column C	95 762.16 17.4 779.56 0 779.56 61.35](367a)](367)](372)](373)](374)](375)](376)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second cost of the cost of	ater heating (not CHP) If there is CHP using [(307b)+(3 restems ondary) on heater or instantaneous ater heating s and fans within dwelling g (307b)+(3 (307b)	Energy kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x (313) x 363)(366) + (368)(372 309) x bus heater (312) x 373) + (374) + (375) = ng (331)) x	Column C	95 762.16 17.4 779.56 0 779.56 61.35 154.05](367a)](367)](372)](373)](374)](375)](376)](378)

		User E	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Proporty	Strom Softwa Address	are Ve	rsion:		Versio	on: 1.0.5.51	
Address :		торену	Address	. Sample	ez (IVIIG))			
1. Overall dwelling dime	nsions:								
			a(m²)	L	Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor			66.25	(1a) x		3	(2a) =	198.75	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (66.25	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	198.75	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0] = [0	X	20 =	0	(6b)
Number of intermittent fa	ns				2	X	10 =	20	(7a)
Number of passive vents				Ē	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X	40 =	0	(7c)
							Air ch	nanges <mark>per</mark> ho	our
Infilt <mark>ration</mark> due to chimne	ys, flues and fans = $(6a)+(6b)+(6b)$	7a)+(7b)+((7c) =		20		÷ (5) =	0.1	(8)
	een carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			_
Number of storeys in the Additional infiltration	ne dweiling (ns)					[(9)]	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame of	r 0.35 fo	r masoni	rv consti	ruction	[(0)	1]X0.1 =	0	(11)
	resent, use the value corresponding			•					` ′
deducting areas of opening	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or () 1 (coal	ad) also	ontor O					(42)
If no draught lobby, en	,). I (Seal	eu), eise	enter 0				0	(12)
• ,	s and doors draught stripped							0	(14)
Window infiltration	3 11		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	-	•	•	etre of e	envelope	area	5	(17)
·	ity value, then $(18) = [(17) \div 20] +$							0.35	(18)
Air permeability value applie Number of sides sheltere	s if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	·u		(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2\m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
, ,	1 1 2 3.00	1		<u> </u>	1			J	

Adjusted infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.38	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
Calculate effec		-	rate for t	he appli	cable ca	se	l				!		
If mechanica												0	(23
If exhaust air he) = (23a)			0	(23
If balanced with		•	•	_								0	(23
a) If balance		i				<u> </u>		ŕ	, 		``	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech		entilation	without	heat rec	overy (N	ЛV) (24b	p)m = (22)	r ´ `	- 		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n				•	•				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		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	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. Heat losse	s and he	at loss i	naramet	or.								_	_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U	K)	k-value		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1	=	2.4	ń.			(26
Vin <mark>dows</mark> Type	1				1.24	x1	/[1/(1.4)+	0.04] =	1.64	Ħ			(27
Vindows Type	2				8.8	x1.	/[1/(1.4)+	0.04] =	11.67	Ħ			(27
Vindows Type					4.12	x1	/[1/(1.4)+	0.04] =	5.46	4			(27
Valls Type1	31.8	8	12.9	<u> </u>	18.88	_	0.18		3.4	╡ ┌			(29
Valls Type2	18.7		1.24	=	17.51	=	0.18	- -	3.15	-		╡	(29
Valls Type3		_		_				╡ ゙					
Valls Type3 Valls Type4	11.		2.4		8.7	×	0.18	=	1.57	- 		╡	(29
	2.4		0		2.4	×	0.18	=	0.43				(29
otal area of e			effo odivo vvi	ndow II ve	64.05		formula 1	/[/4/	·a) · 0 041 ·	a airan in	naraaranl		(3
for windows and * include the area						ateu usirig	i ioiiiiuia i	/[(1/ U- vait	1 0)+0.04] a	as giveri iri	paragrapi	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				29.72	2 (33
leat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	664.8	6 (34
hermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.2	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			32.92	2 (37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 37.53	37.35	37.16	36.32	36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38
leat transfer o	coefficie	nt. W/K	•		•		•	(39)m	= (37) + (38)m	•	•	
39)m= 70.45	70.27	70.09	69.24	69.08	68.35	68.35	68.21	68.63	69.08	69.4	69.74		
10.70								i					

Heat loss para	eat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $												
(40)m= 1.06	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		
(10)										Sum(40) ₁		1.05	(40)
Number of days in month (Table 1a)													`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
						!							
1 Motor boot	ing one	ravi roaui	romont								kWh/ye	2011	
4. Water heating energy requirement: kWh/ye											tal.		
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1													(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 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)												I	(43)
not more that 125	litres per	person per	day (all w	ater use, i	not and co	ia) 						ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
-						_	- (2)			m(44) ₁₁₂ =		1023.65	(44)
Energy content of	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= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		_
If instantaneous w	rator haati	ng at paint	of use (no	hot water	e ataragal	ontor () in	hayaa (16		Total = Su	m(45) ₁₁₂ =		1342.17	(45)
If instantaneous w												ı	(45)
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21	ı	(46)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel													(47)
If community heating and no tank in dwelling, enter 110 litres in (47)													
Otherwise if no	_			_				ers) ente	er 'O' in <i>(</i>	(47)			
Water storage			(0.0, 0		/			
a) If manufacturer's declared loss factor is known (kWh/day):										1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
•				ear			(48) x (49)) =			75		(50)
Energy lost from water storage, kWh/year (48) x (49) = 0.75 b) If manufacturer's declared cylinder loss factor is not known:													(==)
Hot water storage loss factor from Table 2 (kWh/litre/day)													(51)
If community heating see section 4.3													
	Volume factor from Table 2a 0												(52)
Temperature factor from Table 2b											0	l •	(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$													(54)
Enter (50) or (•								0.	75	I	(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m 			i	
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	 	(57) (58)
•	Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m												
•				•	•	. ,	, ,		414				
(modified by								<u> </u>		'	00.00		(EO)
(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	I	(59)

Combi	loss ca	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	185.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		(62)
Solar Di	-IW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	185.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		_
		-				-	-	Οι	itput from w	ater heate	r (annual) ₁	12	1890.79	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	83.54	74.14	79.03	72.48	72.21	66.22	65.21	69.33	68.51	75.08	77.34	82.08		(65)
inclu	ıde (57)	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelling	g or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 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=	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59		(66)
Ligh <mark>tin</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	16.82	14.94	12.15	9.2	6.88	5.81	6.27	8.15	10.94	13.9	16.22	17.29		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	188.39	190.35	185.42	174.93	161.69	149.25	140.94	138.98	143.91	154.4	167.64	180.08		(68)
Cookir	ng gains	(calcula	ted in A	opendix	L, equat	tion L15	or L15a)	, also	see Table	5		-		
(69)m=	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76		(69)
Pumps	and fai	ns gains	(Table 5	<u></u> Ба)									•	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)							•	
(71)m=	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07		(71)
Water	heating	gains (T	able 5)			•			•					
(72)m=	112.29	110.32	106.23	100.67	97.05	91.97	87.65	93.18	95.15	100.91	107.41	110.33		(72)
Total i	nternal	gains =	:			(66)	m + (67)m	+ (68)m	n + (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	375.78	373.89	362.08	343.07	323.9	305.3	293.13	298.6	308.28	327.48	349.54	365.97		(73)
6. So	lar gains	S:								•				
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		Access F		Area		Flu			g_ Table 65	_	FF		Gains	
	_	Table 6d		m²			ole 6a	. <u> </u>	Table 6b		able 6c		(W)	_
North	0.9x	0.77	X	8.8	3	x 1	0.63	х	0.63	x	0.7	=	28.6	(74)
North	0.9x	0.77	х	4.1	2	x 1	0.63	x	0.63	x	0.7	=	13.39	(74)
North	0.9x	0.77	х	8.8	3	x 2	0.32	x	0.63	x	0.7	=	54.65	(74)
North	0.9x	0.77	X	4.1	2	x 2	0.32	X	0.63	x	0.7	=	25.59	(74)

	_					,			,			_					_
North	0.9x	0.77		K	8.8	X	3	4.53	X		0.63	×	0.7	=		92.87	(74)
North	0.9x	0.77	:	K	4.12	X	3	34.53	X		0.63	X	0.7	=		43.48	(74)
North	0.9x	0.77	:	K	8.8	X	5	5.46	X		0.63	X	0.7	=		149.17	(74)
North	0.9x	0.77	:	Κ	4.12	X	5	5.46	X		0.63	X	0.7	=		69.84	(74)
North	0.9x	0.77		Κ	8.8	X	7	4.72	X		0.63	X	0.7	=		200.94	(74)
North	0.9x	0.77		Κ	4.12	X	7	4.72	X		0.63	X	0.7	=		94.08	(74)
North	0.9x	0.77		ĸ	8.8	x	7	9.99	X		0.63	X	0.7	=		215.11	(74)
North	0.9x	0.77		K	4.12	X	7	9.99	X		0.63	X	0.7	=		100.71	(74)
North	0.9x	0.77		K	8.8	X	7	4.68	X		0.63	X	0.7	=		200.83	(74)
North	0.9x	0.77		ĸ	4.12	X	7	4.68	X		0.63	X	0.7	=		94.03	(74)
North	0.9x	0.77		K	8.8	X	5	9.25	X		0.63	X	0.7	=		159.34	(74)
North	0.9x	0.77		κ	4.12	x	5	9.25	x		0.63	X	0.7	=		74.6	(74)
North	0.9x	0.77		ĸ	8.8	x	4	1.52	X		0.63	X	0.7	=		111.65	(74)
North	0.9x	0.77		κ	4.12	x	4	1.52	X		0.63	X	0.7	=		52.27	(74)
North	0.9x	0.77		κ	8.8	x	2	4.19	X		0.63	X	0.7	=		65.05	(74)
North	0.9x	0.77		ζ	4.12	x	2	4.19	x		0.63	X	0.7			30.46	(74)
North	0.9x	0.77		κ	8.8	x	1	3.12	X		0.63	X	0.7	=		35.28	(74)
North	0.9x	0.77		K	4.12	X	1	3.12	Х		0.63	X	0.7	=		16.52	(74)
North	0.9x	0.77		ĸ	8.8	х		3.86	x		0.63	X	0.7	=		23.84	(74)
North	0.9x	0.77		ĸ	4.12	х		8.86	x		0.63	Х	0.7	=		11.16	(74)
West	0.9x	0.77		ĸ	1.24	X	1	9.64	X		0.63	X	0.7	=		7.44	(80)
West	0.9x	0.77		ĸ	1.24	x	3	8.42	Х		0.63	X	0.7			14.56	(80)
West	0.9x	0.77	7 :	ĸ	1.24	×	6	3.27	х		0.63	х	0.7	_ =	Г	23.98	(80)
West	0.9x	0.77		ĸ	1.24	×	9	2.28	x		0.63	х	0.7	 =		34.97	(80)
West	0.9x	0.77		κ	1.24	x	1	13.09	x		0.63	x	0.7	_ =	Г	42.86	(80)
West	0.9x	0.77		κ .	1.24	x	1	15.77	x		0.63	x	0.7	<u> </u>		43.87	(80)
West	0.9x	0.77		κ	1.24	x	1	10.22	x		0.63	x	0.7	<u> </u>		41.77	(80)
West	0.9x	0.77	=	ζ .	1.24	x	9	4.68	x		0.63	x	0.7	<u> </u>		35.88	(80)
West	0.9x	0.77		κ	1.24	x	7	3.59	x		0.63	x	0.7	<u> </u>		27.89	(80)
West	0.9x	0.77		ς	1.24	×	4	5.59	x		0.63	X	0.7	=		17.28	(80)
West	0.9x	0.77		κ	1.24	X	2	4.49	x		0.63	×	0.7		T	9.28	(80)
West	0.9x	0.77		ζ	1.24	x	1	6.15	x		0.63	x	0.7	=		6.12	(80)
	_			•		-											
Solar	gains in	watts, ca	lculate	d	for each mon	th			(83)m	ı = Su	m(74)m .	(82)n	1		_		
(83)m=	49.43	94.8	160.32	Ι	253.97 337.8	7	359.7	336.63	269	.81	191.82	112.7	79 61.08	41.12			(83)
Total g	ains – ii	nternal a	nd sola	ar ((84)m = (73) r	n + ((83)m	, watts							_		
(84)m=	425.21	468.68	522.4		597.05 661.7	8	665	629.77	568	.41	500.1	440.2	27 410.62	407.1			(84)
7. Me	an inter	nal temp	erature	e (I	heating seas	on)											
Temp	erature	during he	eating	ре	eriods in the I	iving	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for ga	ins fo	· liv	ving area, h1	,m (s	see Ta	ble 9a)									
	Jan	Feb	Mar	\int	Apr Ma	у	Jun	Jul	A	ug	Sep	Oc	t Nov	Dec			
(86)m=	1	0.99	0.99	\int	0.95 0.83		0.63	0.47	0.5	54	0.82	0.97	0.99	1			(86)

Moon i	ntornal t	ompor	atura in	livina or	22 T1 (fa	allow eta	nc 2 to 7	7 in Tabl	o ()o)					
		20.04	20.28	20.61	20.87	ollow ste	21	20.99	20.91	20.58	20.2	10.0		(87)
` ′ L		Į				dwelling			ļ	20.58	20.2	19.9		(67)
· · · -		20.03	20.04	20.05	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04		(88)
` ′ _	!_					h2,m (se							I	,
(89)m=	1	0.99	0.98	0.93	0.78	0.55	0.37	0.44	0.75	0.96	0.99	1		(89)
_		l				l							I	. ,
						ng T2 (fo					10.01	10.50	1	(00)
(90)m=	18.59	18.77	19.11	19.59	19.92	20.04	20.06	20.06	19.98	19.56	19.01	18.56		(90)
									ı	LA = LIVIN	g area ÷ (4	+) =	0.41	(91)
Mean i	nternal t	empera	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.13	19.29	19.59	20.01	20.31	20.43	20.44	20.44	20.36	19.98	19.49	19.11		(92)
Apply a	adjustme	ent to th	ne mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate		•		
(93)m=	19.13	19.29	19.59	20.01	20.31	20.43	20.44	20.44	20.36	19.98	19.49	19.11		(93)
8. Spac	ce heatir	ng requ	iirement											
Set Ti t	to the m	ean inte	ernal ter	nperatui	re obtair	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utili	isation fa	actor fo	r gains	using Ta	ble 9a								•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisati	ion facto	or for ga	ains, hm	:										
(94)m=	1	0.99	0.98	0.93	0.8	0.58	0.41	0.48	0.77	0.96	0.99	1		(94)
Useful	<mark>g</mark> ains, h	mGm ,	W = (94)	4)m x (84	4)m									
(95)m=	42 3.16	464.59	511.2	555.02	527	388.24	261.3	272.89	387.56	421.46	406.68	405.52		(95)
Monthly	y averaç	ge exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	ss rate t	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1	1044.98 1	1011.35	917.6	769.05	594.79	398.17	262.57	275.57	429.79	647.88	860.2	1039.8		(97)
Space	heating	require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		-	
(98)m=	462.64	367.42	302.36	154.1	50.43	0	0	0	0	168.46	326.53	471.9		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2303.85	(98)
Space	heating	require	ement in	kWh/m²	/year								34.78	(99)
9a. Enei	rav reau	iromon	te – Indi	vidual b	oating e	vetome i	ncluding	micro-C	'HD/					
	heating		its — Iriui	Muuai II	calling s	ysterris i	ricidaling	THICIO-C) IF)					
-	_		t from se	econdar	v/supple	mentary	svstem						0	(201)
	n of spa					,	•	(202) = 1 -	- (201) =				1	(202)
Fractio	n of tota	ıl heatir	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of ma	ain spa	ce heat	ing syste	em 1								93.5	(206)
Efficier	ncy of se	econda	ry/supple	ementar	y heatin	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	 vear
Space	heating))			<u>'</u>				,	
		367.42	302.36	154.1	50.43	0	0	0	0	168.46	326.53	471.9		
(211)m :	= {[(98)n	n x (20	4)] } x 1	00 ÷ (20	06)									(211)
ÌΓ		392.97	323.38	164.82	53.94	0	0	0	0	180.17	349.23	504.71		, ,
L					<u> </u>	I	I	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2464.02	(211)
													·	

Space heating fuel (secondary), kWh/month							
$= \{[(98)m \times (201)]\} \times 100 \div (208)$ (215)m= 0 0 0 0 0	0 0	0 0	0	0	0	1	
(215)m= 0 0 0 0 0	0 0	Total (kWh/ye				0	(215)
Water heating			,	715,1012	2	0	(210)
Output from water heater (calculated above)					_		
	35.75 130.6	143 142.64	160.28	169.19	181.36		_
Efficiency of water heater			1		i	79.8	(216)
` '	79.8 79.8	79.8 79.8	84.95	86.54	87.25		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m							
	70.11 163.66	179.19 178.75	188.69	195.51	207.86		
		Total = Sum(2	(19a) ₁₁₂ =		-	2251.6	(219)
Annual totals			k\	Wh/year	•	kWh/yea	<u>'</u>
Space heating fuel used, main system 1						2464.02	╣
Water heating fuel used						2251.6	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(230c)
boiler with a fan-assisted flue					45		(230e)
Total electricity for the above, kWh/year		sum of (230a)	(230g) =			75	(231)
Electricity for lighting						297.09	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				5087.7	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Energy		Fmiss	ion fac	tor	Emissions	
	kWh/year		kg CO			kg CO2/ye	
Space heating (main system 1)	(211) x		0.2	16	=	532.23	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	486.35	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1018.57	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	38.93	(267)
Electricity for lighting	(232) x		0.5	19	=	154.19	(268)
Total CO2, kg/year		sum o	of (265)(2	271) =		1211.69	(272)
TER =						18.29	(273)

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

67 m² Floor 0 3 m

27.3 m² (fraction 0.407) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:		Argon:	Frame:
DOO	R	Manufactur	er Solid				Wood
Ε		Manufactur	er Windows	low-E, En =	= 0.0 <mark>5, soft</mark> coat	No	
S		Manufactur	er Windows	low-E, En	= 0.05, soft coat	No	
Balco	ony	Manufactur	er Windows	low-E, En =	= 0.05, soft coat	No	

Storey height:

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
E		E	East	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
S	31.65	10.24	21.41	0.15	0	False	N/A
E	2.3	1.44	0.86	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
			Р	roperty.	Address	Sample	e 3 (Mid)				
Address :											
1. Overall dwelling dime	ensions:			Δ	- (m- 2)		Av. Ha	: au la 4 / 124 \		Value o/m	3/
Ground floor				Area	a(m²) 67	(1a) x		ight(m)	(2a) =	Volume(m	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)-	+(1d)+(1e	e)+(1r	ገ)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	ry +	other 0] = [total 0	X 4	40 =	m³ per hou	ur (6a)
Number of open flues	0	╣ + 片	0	- - - - - -	0	」] = [0	x 2	20 =	0	(6b)
Number of intermittent fa			0		0	J L			10 =		(7a)
						Ļ	0		10 =	0	╡`´
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires						0	X 4	40 =	0	(7c)
									Air ch	nanges per h	our
Infiltration due to chimne	evs. flues and	fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	\ __	0		÷ (5) =	0	(8)
If a pressurisation test has I						continue fr			. (5)	Ü	(``
Number of storeys in t	he dw <mark>elling</mark> (r	ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p						•	uction			0	(11)
deducting areas of open			portaing to	ine great	er wan are	a (anter					
If suspended wooden	floor, enter 0.	2 (unseal	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window	s and doors c	lraught st	ripped		0.25 - [0.2	v (14) · 1	001 -			0	(14)
Window infiltration Infiltration rate					•	, ,	00] = (2) + (13) -	+ (15) -		0	(15)
Air permeability value,	a50 express	ed in cub	ic metre	es ner ho					area	3	(16)
If based on air permeabi				•		•	0110 01 0	птоюро	aroa	0.15	(18)
Air permeability value appli	•						is being us	sed		00	(` '
Number of sides sheltered	ed									2	(19)
Shelter factor					(20) = 1 -	`	[9)] =			0.85	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	<u> </u>	· ·			Ι ,			T		1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp		1	2.0	20	0.7	4	4.0	4.5	4.7	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (2	22)m ÷ 4										
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effect		•	rate for t	he appli	cable ca	se		ı			!		
If mechanica			l' N. (0	al.) (aa	\ - /			. (00)) (OO)			0.5	(238
If exhaust air h									o) = (23a)			0.5	(23h
If balanced with		•	•	_								79.05	(230
a) If balance	ı —					<u> </u>	- 	í `	- 		- ` 	i ÷ 100] I	(24
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24a
b) If balance	i						- ^ ` ` 	ŕ	 		Ι ,	1	(0.41)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h				•					.5 × (23b)	_	•	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n					•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and he	eat loss i	paramete	er:							_	_	
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1.4	=	3.36				(26)
Win <mark>dows</mark> Type	1				1.44	X	1/[1/(1)+	0.04] =	1.38	Ħ			(27)
Windows Type	2				5.44	X	1/[1/(1)+	0.04] =	5.23	Ħ			(27)
Windows Type	3				4.8	×	1/[1/(1)+	0.04] =	4.62	5			(27)
Walls Type1	31.6	35	10.24	4	21.41	X	0.15		3.21	= [$\neg \vdash$	(29)
Walls Type2	2.3	3	1.44		0.86	X	0.15		0.13	=		7 H	(29)
Walls Type3	11.	1	2.4		8.7	X	0.15	=	1.3	F i		-	(29)
Walls Type4	2.4		0	=	2.4	x	0.35	=	0.84	=		-	(29)
Total area of e					47.45								(31)
* for windows and			effective wi	ndow U-va			formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragraph	n 3.2	(-)
** include the area	as on both	sides of ir	nternal wal	ls and par	titions								
Fabric heat los		,	U)				(26)(30)) + (32) =				20.07	(33)
Heat capacity		` ,						((28).	(30) + (32	2) + (32a).	(32e) =	467.18	(34)
Thermal mass	•	,		,					tive Value			250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	indicative	e values of	TMP in T	able 1f		
Thermal bridge					-	<						7.12	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) ±	· (36) =			07.40	(37)
Ventilation hea		alculated	monthly	,					= 0.33 × (25)m × (5)	27.19	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m= 17.73	17.52	17.31	16.25	16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer of	<u> </u>		I		l		L	<u> </u>			1	J	、
(39)m= 44.92	44.71	44.5	43.44	43.23	42.17	42.17	41.96	42.6	43.23	43.65	44.08	l	

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.67	0.67	0.66	0.65	0.65	0.63	0.63	0.63	0.64	0.65	0.65	0.66		
Numbe	or of day	e in moi	nth (Tab	lo 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.65	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
												<u> </u>		
4. Wa	iter heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		17		(42)
Reduce	the annua	al average		usage by	5% if the d	welling is	designed t	(25 x N) to achieve		se target o		5.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			1			
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		—
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1029.18	(44)
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
										Γotal = Su	m(45) ₁₁₂ =		1349.41	(45)
								boxes (46,						(40)
(46)m= Water	20.99 storage	18.35 loss:	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	_		includir	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	ınd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
,			m Table			(.,, , .					0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
•			eclared o	-										
		_	factor free section		e 2 (KVVI	n/litre/da	ıy)				0.	.02		(51)
	•	from Ta		JII 4.0							1.	.03		(52)
Tempe	rature fa	actor fro	m Table	2b							—	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	.03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	m Table	3							0		(58)
	•				,	•	. ,	65 × (41)						
•							ı —	ng and a			<u> </u>			(50)
(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 calculated for each	month (61) m = (60))) ÷ 365 x (41)m			
(61)m= 0 0 0	0 0	0 0 0	0 0	0 0	(61)
Total heat required for water he	eating calculated fo	r each month (62)m	$= 0.85 \times (45) \text{m} +$	(46)m + (57)m +	· (59)m + (61)m
(62)m= 195.18 172.29 181.54	163.58 160.9 14	44.64 139.74 152.	2 151.57 169.58	178.26 190.77	(62)
Solar DHW input calculated using Appe	endix G or Appendix H ((negative quantity) (ente	'0' if no solar contribu	tion to water heating)	•
(add additional lines if FGHRS	and/or WWHRS ap	oplies, see Appendi	(G)		_
(63)m= 0 0 0	0 0	0 0 0	0 0	0 0	(63)
FHRS 18.03 16.04 16.49	14.58 14.03 1	2.18 11.28 12.9	13.08 15.09	16.32 17.54	(63) (G2)
Output from water heater					_
(64)m= 174.47 153.83 162.37	146.4 144.19 12	29.86 125.78 136.5	8 135.89 151.81	159.35 170.55	
		C	utput from water heate	er (annual) ₁₁₂	1791.08 (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	<u> </u>
(65)m= 90.74 80.63 86.21	79.4 79.34 7	73.1 72.31 76.4	5 75.41 82.23	84.28 89.27	(65)
include (57)m in calculation of	of (65)m only if cylin	nder is in the dwellir	g or hot water is f	rom community h	neating
5. Internal gains (see Table 5	and 5a):				
Metabolic gains (Table 5), Watt	ts				_
Jan Feb Mar	Apr May	Jun Jul Au	Sep Oct	Nov Dec	
(66)m= 108.56 108.56 108.56	108.56 108.56 10	08.56 108.56 108.5	6 108.56 108.56	108.56 108.56	(66)
Ligh <mark>ting gains (calculated in Ap</mark>	pendix L, equation	L9 or L9a), also se	e Table 5		
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6. <mark>66</mark> 8.66	11.62 14.75	17.22 18.36	(67)
Appliances gains (calculated in	Appendix L, equat	tion L13 <mark>or L13</mark> a), a	so see Table 5		
(68)m= 190.2 192.17 187.2	176.61 163.24 15	50.68 142.29 140.3	2 145.29 155.88	169.24 181.8	(68)
Cooking gains (calculated in Ap	ppendix L, equation	L15 or L15a), also	see Table 5		•
(69)m= 33.86 33.86 33.86	33.86 33.86 3	33.86 33.86 33.8	33.86 33.86	33.86 33.86	(69)
Pumps and fans gains (Table 5	5a)	•	•	•	
(70)m= 0 0 0	0 0	0 0 0	0 0	0 0	(70)
Losses e.g. evaporation (negat	tive values) (Table :	5)	•	•	•
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85 -8	86.85 -86.85 -86.8	5 -86.85 -86.85	-86.85 -86.85	(71)
Water heating gains (Table 5)			•	•	•
(72)m= 121.96 119.98 115.87	110.27 106.64 10	01.53 97.18 102.7	5 104.73 110.52	117.06 119.99	(72)
Total internal gains =		(66)m + (67)m + (68)	m + (69)m + (70)m + (7	71)m + (72)m	,
(73)m= 385.59 383.58 371.53	352.22 332.75 31	13.94 301.7 307.2	9 317.21 336.72	359.09 375.72	(73)
6. Solar gains:					
Solar gains are calculated using solar	r flux from Table 6a and	associated equations to	convert to the applica	ble orientation.	
Orientation: Access Factor	Area	Flux	g_ 	FF	Gains
Table 6d	m²	Table 6a	Table 6b T	able 6c	(W)
East 0.9x 0.77 x	1.44 ×	19.64 X	0.4 ×	0.7 =	5.49 (76)
East 0.9x 0.77 x	1.44 ×	38.42 X	0.4 ×	0.7 =	10.74 (76)
East 0.9x 0.77 x	1.44 ×	63.27 ×	0.4 ×	0.7	17.68 (76)
East 0.9x 0.77 x	1.44 ×	92.28 ×	0.4 ×	0.7	25.78 (76)

East 0.9x 0.77 x 1.44 x 113.09 x 0.4 x 0.7 = 31.6 East 0.9x 0.77 x 1.44 x 115.77 x 0.4 x 0.7 = 32.35 East 0.9x 0.77 x 1.44 x 110.22 x 0.4 x 0.7 = 30.8 East 0.9x 0.77 x 1.44 x 94.68 x 0.4 x 0.7 = 26.45 East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74 East 0.9x 0.77 x 1.44 x 24.49 x 0.4 x 0.7 = 6.84	
East 0.9x 0.77 x 1.44 x 110.22 x 0.4 x 0.7 = 30.8 East 0.9x 0.77 x 1.44 x 94.68 x 0.4 x 0.7 = 26.45 East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	(76) (76) (76)
East 0.9x 0.77 x 1.44 x 94.68 x 0.4 x 0.7 = 26.45 East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	(76) (76)
East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	(76)
East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	╡゛゛
515A 515	1(76)
East $0.9x \mid 0.77 \mid x \mid 1.44 \mid x \mid 24.49 \mid x \mid 0.4 \mid x \mid 0.7 \mid = 1 6.84$	╡`′
	<u> </u> (76)
East 0.9x 0.77 x 1.44 x 16.15 x 0.4 x 0.7 = 4.51	<u></u> (76)
South 0.9x 0.77 x 5.44 x 46.75 x 0.4 x 0.7 = 49.35	<u> </u> (78)
South 0.9x 0.77 x 4.8 x 46.75 x 0.4 x 0.7 = 43.54	<u> </u> (78)
South 0.9x 0.77 x 5.44 x 76.57 x 0.4 x 0.7 = 80.82	(78)
South 0.9x 0.77 x 4.8 x 76.57 x 0.4 x 0.7 = 71.31	(78)
South 0.9x 0.77 x 5.44 x 97.53 x 0.4 x 0.7 = 102.95	(78)
South 0.9x 0.77 x 4.8 x 97.53 x 0.4 x 0.7 = 90.84	(78)
South 0.9x 0.77 x 5.44 x 110.23 x 0.4 x 0.7 = 116.36	(78)
South 0.9x 0.77 x 4.8 x 110.23 x 0.4 x 0.7 = 102.67	(78)
South 0.9x 0.77 x 5.44 x 114.87 x 0.4 x 0.7 = 121.26	(78)
South 0.9x 0.77 x 4.8 x 114.87 x 0.4 x 0.7 = 106.99	(78)
South 0.9x 0.77 x 5.44 x 110.55 x 0.4 x 0.7 = 116.69	(78)
South 0.9x 0.77 x 4.8 x 110.55 x 0.4 x 0.7 = 102.96	(78)
South 0.9x 0.77 x 5.44 x 108.01 x 0.4 x 0.7 = 114.01	(78)
South 0.9x 0.77 x 4.8 x 108.01 x 0.4 x 0.7 = 100.6	(78)
South 0.9x 0.77 x 5.44 x 104.89 x 0.4 x 0.7 = 110.72	(78)
South 0.9x 0.77 x 4.8 x 104.89 x 0.4 x 0.7 = 97.7	(78)
South 0.9x 0.77 x 5.44 x 101.89 x 0.4 x 0.7 = 107.55	(78)
South 0.9x 0.77 x 4.8 x 101.89 x 0.4 x 0.7 = 94.9	(78)
South 0.9x 0.77 x 5.44 x 82.59 x 0.4 x 0.7 = 87.18	(78)
South 0.9x 0.77 x 4.8 x 82.59 x 0.4 x 0.7 = 76.92	(78)
South 0.9x 0.77 x 5.44 x 55.42 x 0.4 x 0.7 = 58.5	– (78)
South 0.9x 0.77 x 4.8 x 55.42 x 0.4 x 0.7 = 51.62	(78)
South 0.9x 0.77 x 5.44 x 40.4 x 0.4 x 0.7 = 42.64	(78)
South 0.9x 0.77 x 4.8 x 40.4 x 0.4 x 0.7 = 37.63	(78)
0.17	
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 98.38 162.87 211.48 244.82 259.85 252 245.41 234.88 223.01 176.83 116.95 84.78	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 483.97 546.46 583.01 597.03 592.6 565.95 547.11 542.17 540.21 513.55 476.04 460.5	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(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= 0.99 0.97 0.93 0.83 0.67 0.48 0.34 0.36 0.54 0.82 0.97 0.99	(86)
	,

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.58 20.71 20.84 20.95 20.99 21 21 21 21 20.96 20.77 20.56		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 20.37 20.37 20.37 20.39 20.39 20.4 20.4 20.4 20.4 20.39 20.38 20.38		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.99 0.96 0.91 0.8 0.63 0.43 0.29 0.31 0.5 0.79 0.96 0.99		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 19.82 20 20.18 20.33 20.38 20.4 20.4 20.4 20.4 20.4 20.35 20.1 19.8		(90)
fLA = Living area ÷ (4) =	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		1
(92)m= 20.13 20.29 20.45 20.58 20.63 20.65 20.65 20.65 20.64 20.6 20.38 20.11		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 20.13 20.29 20.45 20.58 20.63 20.65 20.65 20.65 20.64 20.6 20.38 20.11		(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-calc the utilisation factor for gains using Table 9a	ulate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.98 0.96 0.91 0.81 0.64 0.45 0.31 0.33 0.51 0.8 0.96 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 476.34 525.75 533.03 481.35 381.93 254.81 170.65 178.25 278.11 411.13 455.33 455		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 711.05 687.98 620.71 507.6 386.06 254.99 170.66 178.26 278.67 432.16 579.55 701.23		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 174.63 109.02 65.23 18.9 3.07 0 0 0 15.65 89.43 183.19		1
Total per year (kWh/year) = $Sum(98)_{15,912}$ =	659.13	(98)
Space heating requirement in kWh/m²/year	9.84	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; the includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	ne latter	1
Fraction of heat from Community boilers	1	(303a)
Fraction of total space heat from Community boilers (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	
Annual space heating requirement	659.13]

Space heat from Community boilers		(98) x (304a) x	(305) x (306) =	Г	692.08	(307a)
Efficiency of secondary/supplementary hea	iting system in % (from Tal	ole 4a or Appen	dix E)		0	(308
Space heating requirement from secondary	//supplementary system	(98) x (301) x 1	00 ÷ (308) =		0	(309)
Water heating Annual water heating requirement					1791.08]
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =		1880.63	(310a)
Electricity used for heat distribution	0	01 × [(307a)(307	e) + (310a)(310e)]	- [25.73	(313)
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling sy	stem, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwelling mechanical ventilation - balanced, extract of	· ,	de		Г	119.54	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330l	b) + (330g) =		119.54	(331)
Energy for lighting (calculated in Appendix	L)				315.44	(332)
Total delivered energy for all uses (307) + ((309) + (310) + (312) + (31	5) + (331) + (<mark>3</mark> 3	32)(237b) =		3007.71	(338)
12b. CO2 Emissions - Community heating	scheme					
CO2 from other sources of space and wate Efficiency of heat source 1 (%)	k	nergy Wh/year els repeat (363) to	Emission factors to the second (366) for the second	kg	nissions CO2/year	(367a)
	er heating (not CHP) If there is CHP using two fu	Wh/year	kg CO2/kWh	kg	CO2/year](367a)](367)
Efficiency of heat source 1 (%)	er heating (not CHP) If there is CHP using two fu	Wh/year els repeat (363) to x 100 ÷ (367b) x	kg CO2/kWh	kg	CO2/year	_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	r heating (not CHP) If there is CHP using two fu [(307b)+(310b)]	Wh/year els repeat (363) to x 100 ÷ (367b) x	(366) for the second 0.22 0.52	kg fuel [= [95 584.95	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	r heating (not CHP) If there is CHP using two fu [(307b)+(310b)] [(313) > ems (363)	Wh/year els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372	(366) for the second 0.22 0.52	kg fuel [= [95 584.95 13.35	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Real ting (not CHP)	wh/year els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372	(366) for the second (0.22	kg fuel [= [= [95 584.95 13.35 598.31	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon	the the ting (not CHP) If there is CHP using two full [(307b)+(310b)] [(313) > (363) dary) (309) x heater or instantaneous h	wh/year els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372	(366) for the second (0.22	kg fuel [= [= [= [95 584.95 13.35 598.31](367)](372)](373)](374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion	the ting (not CHP) If there is CHP using two full [(307b)+(310b)] [(313) > (363) dary) the heater or instantaneous her heating (373) +	wh/year els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) =	(366) for the second (0.22	kg fuel [= [= [= [95 584.95 13.35 598.31 0](367)](372)](373)](374)](375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and water	the ting (not CHP) If there is CHP using two full [(307b)+(310b)] [(313) > (363) dary) the heater or instantaneous her heating (373) +	els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) = (31)) x	(366) for the second (0.22	kg fuel [= [= [= [= [95 584.95 13.35 598.31 0 0 598.31](367)](372)](373)](374)](375)](376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a CO2 associated with electricity for lighting	the the ting (not CHP) If there is CHP using two full [(307b)+(310b)] [(313) > (363) dary) the the terms (363) the the terms (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373) + (373	els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) = (31)) x	(366) for the second (366) for	kg fuel [= [= [= [= [= [95 584.95 13.35 598.31 0 0 598.31 62.04](367)](372)](373)](374)](375)](376)](378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a CO2 associated with electricity for lighting Total CO2, kg/year	the the ting (not CHP) If there is CHP using two full [(307b)+(310b)] [(313) > (363) dary) The there is CHP using two full [(313) > (363) (309) x The the term or instantaneous has a continuous full form (373) + (332)))	els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) = (31)) x	(366) for the second (366) for	kg fuel [= [= [= [= [= [95 584.95 13.35 598.31 0 0 598.31 62.04 163.72](367)](372)](373)](374)](375)](376)](378)](379)

			User <u>C</u>	Details:						
Assessor Name: Software Name:	Stroma FSAP 2	2012		Strom Softwa				Versio	on: 1.0.5.51	
		P	roperty	Address	: Sampl	e 3 (Mid)			
Address :										
1. Overall dwelling dimer	nsions:		A	- (··· 2)		A., 11-	: l- 4/ \		Value of m	2)
Ground floor			Are	a(m²)	(1a) x	AV. HE	gight(m)	(2a) =	Volume(m	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	(1e)+(1ı	n)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	ry □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	.ır (6a
·			」 		」		=	20 =		╡`
Number of open flues	0	0	」 ' L	0	J - [0			0	(6b)
Number of intermittent far	1S				Ĺ	2		10 =	20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fir	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimney	rs flues and fans –	(6a)+(6b)+(7	7a)+(7b)+((7c) =	Г	20	_	÷ (5) =		(8)
If a pressurisation test has be					continue f	20 from (9) to		÷ (5) =	0.1	(6)
Number of storeys in th	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11
if both types of wall are pre deducting areas of opening		rresponding to	the grea	ter wall are	a (after					
If suspended wooden fl		ealed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, enter	er 0.05, else enter	0							0	(13
Percentage of windows	and doors draugh	t stripped							0	(14
Window infiltration				0.25 - [0.2	` '				0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, or If based on air permeability	•		•	•	•	netre of e	envelope	area	5	(17
Air permeability value applies	-					ris beina u	ısed		0.35	(18
Number of sides sheltered		nac scon ac.		g. oo a po		10 2011.g ta			2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wind spe	eed							_	
Jan Feb	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m (22	n) m : 4									
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1	:)m ÷ 4 .23	3 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
1.20	1.1	0.00	L 3.33	1 0.02	<u> </u>	1	12	10	J	

Adjusted infiltra	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	0.27	0.3	0.32	0.33	0.35]	
Calculate effect		_	rate for t	he appli	cable ca	se							
If mechanica							.=					0	(23
If exhaust air he) = (23a)			0	(23
If balanced with		-	•	_								0	(23
a) If balance		anical ve				ery (MVI	- ` ` - 	<u> </u>	2b)m + (- 	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	entilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h if (22b)n				•	-				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n				•					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]	(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) 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 losse	o and he	ot loca i	ooromet	Dr.									_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
Doors					2.4	x	1	=	2.4	$\stackrel{\cdot}{\Box}$			(26
Vin <mark>dows</mark> Type	1				1.44	x1,	 /[1/(1.4)+	0.04] =	1.91	Ħ			(27
Vindows Type					5.44	x1	/[1/(1.4)+	0.04] =	7.21	Ĕ			(27
Vindows Type	3				4.8	х1	/[1/(1.4)+	0.04] =	6.36				(27
Valls Type1	31.6	65	10.24	4	21.41	Х	0.18	=	3.85				(29
Valls Type2	2.3	В	1.44		0.86	X	0.18	= [0.15				(29
Valls Type3	11.	1	2.4		8.7	X	0.18	=	1.57				(29
Valls Type4	2.4	,	0		2.4	x	0.18	=	0.43	₹ i		$\neg \ \ $	(29
otal area of e	lements	, m²			47.45	<u>=</u>							(31
for windows and * include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	n 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				23.8	9 (3:
leat capacity		,	,					((28).	(30) + (32	2) + (32a).	(32e) =	467.1	
hermal mass		` '	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix k	<						2.37	(36
details of thermatorial fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			26.20	37
entilation hea		alculated	d monthly	/					= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 37.92	37.74	37.56	36.71	36.55	35.81	35.81	35.67	36.09	36.55	36.87	37.21	1	(38
Heat transfer of	nefficie	nt \///K						(39)m	= (37) + (37)	38)m		1	
		r	62.07	62.81	62.07	62.07	61.93	62.36	62.81	63.13	63.47	1	
39)m= 64.19	64	63.82	62.97	02.01	1 02.U/	02.07	01.50	02.30	1 02.01	1 00.10	03.47		

Heat Id	ss para	meter (H	HLP), W	m²K			_		(40)m	= (39)m ÷	- (4)			
(40)m=	0.96	0.96	0.95	0.94	0.94	0.93	0.93	0.92	0.93	0.94	0.94	0.95		_
Numbe	er of day	rs in mor	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	ter heat	ing ener	rgy requi	rement:								kWh/yea	ar:	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		17		(42)
Reduce	the annua	al average		usage by	5% if the d	welling is	designed i	(25 x N) to achieve		se target o		.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea			ctor from	Table 1c x							
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34	4000.40	7(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1029.18	(44)
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If inoton	anacua u	entor honti	ng at paint	of use (no	hot water	otoragal	ontor 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =		1349.41	(45)
(46)m=	20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
` '	storage		10.94	10.51	13.64	13.07	12.01	14.54	14.71	17.13	10.72	20.32		(40)
Storag	e volum	e (litres)	includir	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
	-	_	ind no ta		_			(47) mbi boil	ora) onto	or 'O' in <i>(</i>	(4 7)			
	storage		not wate	:i (tili5 ii	iciuues ii	iistaiitai	ieous cc	יווטט וטוווע	ers) erite	91 0 111 (41)			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Tempe	rature f	actor fro	m Table	2b							0.	54		(49)
٠.			storage eclared o			or io not		(48) x (49)) =		0.	75		(50)
,			factor fr	•								0		(51)
	-	_	ee secti	on 4.3										
		from Tal	ble 2a m Table	2h							—	0		(52)
•			storage		oor			(47) x (51)	v (52) v (53) –		0		(53)
٠,		54) in (5	•	, KVVII/ y t	zai			(47) X (01)	/ X (32) X (55) =	-	0 75		(54) (55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendix	Н	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	•				•	•	. ,	65 × (41)						
-	_							ng and a			· ·	22.00		(50)
(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 calculated for each	n month (61)m - (60) ÷ '	365 v (41)m			
(61)m= 0 0 0		0 0	T 0 T 0	0 0	(61)
Total heat required for water he	eating calculated for ea		 = 0.85 × (45)m +	(46)m + (57)m +	」 - (59)m + (61)m
(62)m= 186.5 164.45 172.86	155.17 152.22 136.24		143.17 160.9	169.86 182.09	(62)
Solar DHW input calculated using App	pendix G or Appendix H (nega	ative quantity) (enter ')' if no solar contribu	tion to water heating) L
(add additional lines if FGHRS					
(63)m= 0 0 0	0 0 0	0 0	0 0	0 0	(63)
FHRS 0 0 0	0 0 0	0 0	0 0	0 0	(63) (G2)
Output from water heater					
(64)m= 186.5 164.45 172.86	155.17 152.22 136.24	131.06 143.52	143.17 160.9	169.86 182.09]
		Out	put from water heate	er (annual) ₁₁₂	1898.03 (64)
Heat gains from water heating,	, kWh/month 0.25 ´ [0.8	5 × (45)m + (61)r	n] + 0.8 x [(46)m	+ (57)m + (59)m	n]
(65)m= 83.79 74.35 79.26	72.68 72.4 66.38	65.36 69.5	68.68 75.28	77.56 82.33	(65)
include (57)m in calculation	of (65)m only if cylinder	is in the dwelling	or hot water is f	rom community I	neating
5. Internal gains (see Table 5	5 and 5a):				
Metabolic gains (Table 5), Wat	tts				_
Jan Feb Mar	Apr May Jun	Jul Aug	Sep Oct	Nov Dec	
(66)m= 108.56 108.56 108.56	108.56 108.56 108.56	108.56	108.56 108.56	108.56 108.56	(66)
Lighting gains (calculated in Ap	ppendix L, equation L9	or L9a), also see	Table 5		
(67)m= 17.41 15.46 12.58	9.52 7.12 6.01	6.49 8.44	11.33 14.38	16.79 17.89	(67)
Appliances gains (calculated in	Appendix L, equation	L13 or L13a), als	o see Table 5		-
(68)m= 190.2 192.17 187.2	176.61 163.24 150.68	142.29 140.32	145.29 155.88	169.24 181.8	(68)
Cooking gains (calculated in A	ppendix L, equation L1	5 or L15a), also s	ee Table 5		-
(69)m= 33.86 33.86 33.86	33.86 33.86 33.86	33.86 33.86	33.86 33.86	33.86 33.86	(69)
Pumps and fans gains (Table 5	5a)	•		•	-
(70)m= 3 3 3	3 3 3	3 3	3 3	3 3	(70)
Losses e.g. evaporation (nega-	tive values) (Table 5)	-			-
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -86.85	-86.85 -86.85	(71)
Water heating gains (Table 5)	-	-	-		-
(72)m= 112.63 110.65 106.53	100.94 97.31 92.19	87.85 93.42	95.4 101.18	107.72 110.65	(72)
Total internal gains =	(6	6)m + (67)m + (68)m	+ (69)m + (70)m + (7	71)m + (72)m	-
(73)m= 378.8 376.85 364.87	345.64 326.23 307.45	5 295.2 300.74	310.58 330.01	352.32 368.92	(73)
6. Solar gains:					
Solar gains are calculated using sola	er flux from Table 6a and asso	ociated equations to c	onvert to the applica	ble orientation.	
Orientation: Access Factor		lux	g_ 	FF	Gains
Table 6d	m² Ta	able 6a	Гable 6b Т	able 6c	(W)
East 0.9x 0.77 x	1.44 X	19.64 ×	0.63 ×	0.7 =	8.64 (76)
East 0.9x 0.77 x	1.44 X	38.42 X	0.63 ×	0.7 =	16.91 (76)
East 0.9x 0.77 x	1.44 X	63.27 ×	0.63 ×	0.7 =	27.85 (76)
East 0.9x 0.77 x	1.44 X	92.28 X	0.63 ×	0.7	40.61 (76)

East	0.9x	0.77	x	1.44	4	x	11	3.09	x		0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	×	1.44	4	x	11	5.77	X		0.63	x	0.7		50.95	(76)
East	0.9x	0.77	x	1.44	4	x	11	0.22	X		0.63	X	0.7	=	48.51	(76)
East	0.9x	0.77	×	1.44	4	x	94	4.68	x		0.63	X	0.7	=	41.67	(76)
East	0.9x	0.77	x	1.44	4	x	7:	3.59	x		0.63	X	0.7		32.39	(76)
East	0.9x	0.77	X	1.44	4	x	4:	5.59	x		0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	X	1.44	4	x	24	4.49	X		0.63	X	0.7	=	10.78	(76)
East	0.9x	0.77	X	1.44	4	x	10	6.15	X		0.63	X	0.7	=	7.11	(76)
South	0.9x	0.77	X	5.44	4	x	40	6.75	x		0.63	x	0.7	=	77.73	(78)
South	0.9x	0.77	X	4.8		x	40	6.75	X		0.63	X	0.7	=	68.58	(78)
South	0.9x	0.77	X	5.44	4	x	70	6.57	X		0.63	X	0.7	=	127.3	(78)
South	0.9x	0.77	X	4.8		x	70	6.57	X		0.63	X	0.7	=	112.32	(78)
South	0.9x	0.77	X	5.44	4	x	9	7.53	X		0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77	X	4.8		x	9	7.53	X		0.63	X	0.7	=	143.08	(78)
South	0.9x	0.77	X	5.44	4	x	11	0.23	X		0.63	X	0.7	=	183.27	(78)
South	0.9x	0.77	X	4.8		x	11	0.23	x		0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77	X	5.44	4	x	11	4.87	X		0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77	X	4.8		X	11	4.87	Х		0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77	X	5.44	4	x	11	0.55	x		0.63	Х	0.7	=	183.79	(78)
South	0.9x	0.77	X	4.8		x	11	0.55	X		0.63	Х	0.7	=	162.17	(78)
South	0.9x	0.77	X	5.44	4	X	10	8.01	X		0.63	Х	0.7	=	179.57	(78)
South	0.9x	0.77	X	4.8		x	10	8.01	Х		0.63	Х	0.7	=	158.45	(78)
South	0.9x	0.77	X	5.44	4	x	10	4.89	X		0.63	X	0.7	=	174.39	(78)
South	0.9x	0.77	X	4.8		х	10	04.89	X		0.63	X	0.7	=	153.87	(78)
South	0.9x	0.77	X	5.44	4	X	10	1.89	X		0.63	X	0.7	=	169.39	(78)
South	0.9x	0.77	X	4.8		X	10	1.89	X		0.63	X	0.7	=	149.46	(78)
South	0.9x	0.77	X	5.44	4	X	8:	2.59	X		0.63	X	0.7	=	137.3	(78)
South	0.9x	0.77	X	4.8		X	8:	2.59	X		0.63	X	0.7	=	121.15	(78)
South	0.9x	0.77	X	5.44	4	X	5	5.42	X		0.63	X	0.7	=	92.13	(78)
South	0.9x	0.77	X	4.8		X	5	5.42	X		0.63	X	0.7	=	81.29	(78)
South	0.9x	0.77	X	5.44	4	X	4	0.4	X		0.63	X	0.7	=	67.16	(78)
South	0.9x	0.77	X	4.8		X	4	0.4	X		0.63	X	0.7	=	59.26	(78)
•		watts, calc 256.53 3	$\overline{}$	for each 385.59	409.26	_	96.91	386.53	(83)m 369		n(74)m		104.0	133.53	7	(83)
(83)m= Total o	154.95	ternal and	33.08						369	.93	351.23	278.51	184.2	133.53		(63)
(84)m=	533.75		97.95	731.22	735.49	<u> </u>	04.36	681.72	670	.67	661.81	608.52	536.52	502.45	7	(84)
									L							. ,
		nal temper					aroa f	rom Tak	olo O	Th1	(°C)				21	(85)
		during hea tor for gain	•			_			بر عار ال	, 1111	(0)				21	(00)
Otilisa	Jan		Mar	Apr	a, nn, May	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	7	
(86)m=	0.99		0.95	0.87	0.74	+	0.56	0.4	0.4	- +	0.63	0.88	0.98	0.99	1	(86)
(20)2								3	L			3.30	1 5.55	I	Т	(7)

					T4 //		o	·· - · ·	٥.					
Г	- 1		ature in		· `		i	i	· ·	00.00	00.40	00.47	1	(87)
(87)m= [20.21	20.4 during h	20.61 neating p	20.82	20.94	20.99	from Ta	21 hle 0 T	20.98 h2 (°C)	20.83	20.49	20.17		(67)
(88)m=	20.12	20.12	20.12	20.13	20.14	20.15	20.15	20.15	20.14	20.14	20.13	20.13		(88)
L			<u> </u>			<u> </u>	<u> </u>	<u> </u>						, ,
Г	1		ains for			· `	i		0.50	0.05	0.07	0.00	1	(90)
(89)m=	0.99	0.97	0.93	0.84	0.69	0.49	0.32	0.35	0.56	0.85	0.97	0.99		(89)
Mean	internal	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	19.08	19.36	19.65	19.94	20.09	20.14	20.14	20.15	20.13	19.96	19.49	19.03		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.41	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.54	19.78	20.04	20.3	20.44	20.49	20.49	20.49	20.48	20.32	19.89	19.5		(92)
Apply	adjustm	ent to t	he mean	interna	l tempera	ature fro	m Table	4e, whe	ere appro	priate	ļ			
(93)m=	19.54	19.78	20.04	20.3	20.44	20.49	20.49	20.49	20.48	20.32	19.89	19.5		(93)
8. Spa	ace heat	ing requ	uirement				ı	ı	ı	ı				
Set Ti	to the n	nean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9l	b, so tha	ıt Ti,m=(76)m an	d re-calc	ulate	
the uti	lisation	factor fo	or gains	using Ta	ble 9a								i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	tion fact	or for g	ains, hm	:										
(94)m=	0 .99	0.97	0.93	0.85	0.71	0.51	0.35	0.38	0.59	0.86	0.97	0.99		(94)
Usefu	l gains,	hmGm .	W = (94)	4)m x (8	4)m									
(95)m=	52 6.56	612.56	648.09	619.69	520.53	361.94	241.32	253.07	389.85	521.55	519.48	497.39		(95)
Month	ly avera	ige exte	rnal tem	perature	from Ta	ble 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)
г			an intern		· ·		-``	-`	- ` 					
(97)m=	978.32	952.46	864.45	717.63	548.68	365.41	241.63	253.53	397.64	610.24	807.75	971.04		(97)
	- 1		ement fo								ri e		1	
(98)m=	336.11	228.41	160.97	70.52	20.94	0	0	0	0	65.98	207.55	352.4		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1442.89	(98)
Space	e heating	g require	ement in	kWh/m²	²/year								21.54	(99)
9a. Ene	ergy reg	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
	heatin				<u> </u>	,			,					
Fraction	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
			ng from	-	, ,			(204) = (2	02) x [1 –	(203)] =			1	(204)
			ace heat	-				, , ,	, -	, ,-			93.5	(206)
	•		ry/suppl			a cycton	o 0/							(208)
Ellicie	TICY OF S					y system	1						0	
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space		•	ement (c			·							ı	
L	336.11	228.41	160.97	70.52	20.94	0	0	0	0	65.98	207.55	352.4		
(211)m	= {[(98)	m x (20	4)] } x 1	00 ÷ (20)6)	T							ı	(211)
	359.48	244.29	172.17	75.42	22.39	0	0	0	0	70.57	221.98	376.9		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1543.19	(211)
												•		

Space heating fuel (secondary), kWh/month = $\{[(98)\text{m x} (201)]\} \times 100 \div (208)$							
$ = \{ [(90) 11 \times (201)] \} \times 100 \div (200) $ $ (215) m = $	0 0	0 0	0	0	0		
	I	Total (kWh/y	ear) =Sum(215) _{15,101}	<u></u>	0	(215)
Water heating							_
Output from water heater (calculated above) 186.5 164.45 172.86 155.17 152.22 1	36.24 131.06	143.52 143.17	7 160.9	169.86	182.09		
Efficiency of water heater	101.00	110.02	100.0	100.00	102.00	79.8	(216)
· · · · · · · · · · · · · · · · · · ·	79.8 79.8	79.8 79.8	82.64	85.35	86.55		(217)
Fuel for water heating, kWh/month	•		•	•	•	•	
(219) m = (64) m x $100 \div (217)$ m (219)m= 215.94 191.91 204.27 187.27 188.03 1	70.73 164.23	179.84 179.4 ⁻	194.69	199.02	210.39		
	ļ	Total = Sum	(219a) ₁₁₂ =		<u>I</u>	2285.73	(219)
Annual totals			k	Wh/yea	r	kWh/yeaı	
Space heating fuel used, main system 1						1543.19	╛
Water heating fuel used						2285.73	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(2300
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year		sum of (230a	a)(230g) =	:		75	(231)
Electricity for lighting						307.48	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				4211.4	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Energy kWh/year			ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x		0.2	16	=	333.33	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	493.72	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =		_		827.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	38.93	(267)
Electricity for lighting	(232) x		0.5	19	=	159.58	(268)
Total CO2, kg/year		sum	of (265)(271) =		1025.55	(272)
							٦.

TER =

(273)

15.31

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height: 67 m² Floor 0 3 m

27.3 m² (fraction 0.407) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:		Argon:	Fr	ame:
DOO	R	<u>Manufacturer</u>	Solid				Wc	ood
W		Manufacturer	Windows	low-E, $En = 0.05$	s, soft coat	No		
S		Manufacturer	Windows	low-E, En = 0.05	s, soft coat	No		
Balco	ony	Manufactur <mark>er</mark>	Windows	low-E, $En = 0.05$	s, soft coat	No		

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen	<u>ts</u>						
S	31.7	10.24	21.46	0.15	0	False	N/A
W	19	1.44	17.56	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	FSAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 4 (Mid))			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (2\		Av. Ha	: a.b.4/\		Value o/m	3/
Ground floor				Area	a(m²) 67	(1a) x		ight(m)	(2a) =	Volume(m	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	ገ)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdai neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ur (6a)
Number of open flues	0	╡ + ト	0	- - - - - -	0	」	0	x :	20 =	0	(6b)
Number of intermittent fa						J [10 =		(7a)
						Ļ	0		10 =	0	╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges per h	our
Infiltration due to chimne	vs. flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has t						continue fr			. (0) =	0	
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0						•	uction			0	(11)
if both types of wall are p deducting areas of openi			ponding to	the great	er wall are	a (atter					
If suspended wooden	floor, enter ().2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, els	e enter 0								0	(13)
Percentage of window	s and doors	draught st	tripped							0	(14)
Window infiltration					•	2 x (14) ÷ 1	-			0	(15)
Infiltration rate						+ (11) + (1				0	(16)
Air permeability value,				•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabi Air permeability value applie	•						is heina u	sad		0.15	(18)
Number of sides sheltered		allon lest na	s been doi	ie or a det	gree an pe	тпеаышу	is being us	seu		2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter f	actor			(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	or monthly v	wind speed	ł								
Jan Feb	Mar Ap	r May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	eed from Ta	able 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22-) (2	2)m · 4										
Wind Factor $(22a)m = (23a)m $		1.00	0.05	0.95	0.00	1 4	1.08	4 40	1.18	1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	l o.aa	0.92	1	I 1.08	1.12	1.18	I	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effe		•	rate for t	he appli	cable ca	se	!	l					
If mechanica												0.5	(23
If exhaust air h) = (23a)			0.5	(23
If balanced with		-		_								79.05	(23
a) If balance							- ´ ` -	^ `	 		- ` ´	÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	overy (I	MV) (24b	p)m = (22)	2b)m + (23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)r	ouse ex n < 0.5 ×			•	•				.5 × (23k	o)		_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r	ventilation			•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	(25)	-	-	-		
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
3. Heat losse	e and he	at lose i	naram o t	or:									
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
Doors	a. oa	()			2.4	×	1.4	= 1	3.36		,,,,,		(2
Vin <mark>dows</mark> Type	1				1.44		1/[1/(1)+	\ !	1.38	Ħ			(2
Vindows Type							1/[1/(1)+			Ħ			`
Vindows Type					5.44		1/[1/(1)+		5.23	片			(2
Villaows Type Valls Type1			40.0		4.8	=		:	4.62	=			(2
• •	31.		10.24	_	21.46	=	0.15	_ -	3.22	믁 ¦		┥	(2)
Walls Type2	19		1.44		17.56	<u> </u>	0.15	ᆗ -	2.63	<u> </u>		_	(2
Valls Type3	11.	1	2.4		8.7	X	0.15	_ =	1.3	닠 !		⊣	(2
Valls Type4	2.4		0		2.4	X	0.35	=	0.84				(2
Total area of e					64.2								(3
for windows and it include the area						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric heat los				o ana pan	1110110		(26)(30)) + (32) =				22.59	(3
Heat capacity		•	O)				, , , ,		(30) + (3:	2) + (32a).	(32e) =	701.68	==
Thermal mass			P = Cm =	- TFΔ) ir	n k.l/m²K			,	tive Value	, , ,	(020) =	250	(3
For design assess	sments wh	ere the de	tails of the				recisely the				able 1f	230	(0
hermal bridg				ısina Ar	nendix k	<						9.63	(3
details of therma	•	,			•	`						9.03	(0
otal fabric he			o (00)	0,000,11	•/			(33) +	(36) =			32.22	(3
entilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 17.73	17.52	17.31	16.25	16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89	1	(3
 Heat transfer of	coefficier	nt. W/K			•	•	•	(39)m	= (37) + (38)m	•		
39)m= 49.95	49.74	49.52	48.47	48.26	47.2	47.2	46.99	47.62	48.26	48.68	49.1]	
10.00									1	ı			

Heat lo	oss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.75	0.74	0.74	0.72	0.72	0.7	0.7	0.7	0.71	0.72	0.73	0.73		
						Į.	Į.		,	Average =	Sum(40) ₁	12 /12=	0.72	(40)
Numbe	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 requi	rement:								kWh/ye	ear:	
if TF	ned occu FA > 13.9 FA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		17		(42)
Reduce	I averag the annua e that 125	l average	hot water	usage by	5% if the a	lwelling is	designed t	` ,		se target o		.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
											m(44) ₁₁₂ =		1029.18	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If in atom	tonoous w	ator booti	na ot noint	of use /ne	bot water	r ataraga)	antar O in	havea (46		Total = Su	m(45) ₁₁₂ =	_	1349.41	(45)
	taneous w													(40)
(46)m= Water	20.99 storage	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	je volum		includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel	_	0		(47)
	munity h	,										<u> </u>		,
	vise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
٠.	y lost fro		•					(48) x (49)) =		1	10		(50)
,	nanufacti ater stora			•								1		(54)
	munity h	•			e z (KVV	ii/iiiie/ua	iy <i>)</i>				0.	02		(51)
	e factor	_									1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							-	.6		(53)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or (54) in (5	55)	·							1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
												m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(37)111–	' '													
		loss (an	nual) fra	m Table		•			-			0		(58)
Primar	y circuit	`	,			59)m = ((58) ÷ 36	55 × (41)	m			0		(58)
Primar Primar		loss cal	culated t	for each	month (•	. ,	, ,		r thermo		0		(58)

Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (41)m						
(61)m= 0 0 0	0 0	0 0	0	0	0	0	0		(61)
Total heat required for water h	eating calculated	for each month	(62)m = 0	D.85 × (4	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.18 172.29 181.54	163.58 160.9	144.64 139.74	152.2	151.57	169.58	178.26	190.77		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quantit	y) (enter '0' i	f no solar	contributi	on to wate	r heating)	•	
(add additional lines if FGHRS	and/or WWHRS	applies, see Ap	pendix G))					
(63)m= 0 0 0	0 0	0 0	0	0	0	0	0		(63)
FHRS 18.03 16.04 16.49	14.58 14.03	12.18 11.28	12.94	13.08	15.09	16.32	17.54		(63) (G2)
Output from water heater									
(64)m= 174.47 153.83 162.37	146.4 144.19	129.86 125.78	136.58	135.89	151.81	159.35	170.55		_
			Outpu	ıt from wa	ter heate	(annual) _{1.}	12	1791.08	(64)
Heat gains from water heating	kWh/month 0.2	5 ´ [0.85 × (45)n	n + (61)m]	+ 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.74 80.63 86.21	79.4 79.34	73.1 72.31	76.45	75.41	82.23	84.28	89.27		(65)
include (57)m in calculation	of (65)m only if c	ylinder is in the	dwelling o	r hot wa	ater is fr	om com	munity h	eating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	its								
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56 108.56	108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in A	opendix L, equat	ion L9 or L9a), a	also see Ta	able 5					
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6.66	8.66	11.62	14.75	17.22	18.36		(67)
Appliances gains (calculated in	n Appendix L, eq	uation L13 or L1	3a), also s	see Tab	ole 5				
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in A	ppendix L, equat	tion L15 or L15a), also see	e Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table	5a)							•	
(70)m= 0 0 0	0 0	0 0	0	0	0	0	0		(70)
Losses e.g. evaporation (nega	tive values) (Tab	ole 5)		·				•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)			•	•				•	
(72)m= 121.96 119.98 115.87	110.27 106.64	101.53 97.18	102.75	104.73	110.52	117.06	119.99		(72)
Total internal gains =		(66)m + (67)r	n + (68)m + ((69)m + (7	70)m + (7	1)m + (72)	m		
(73)m= 385.59 383.58 371.53	352.22 332.75	313.94 301.7	307.29	317.21	336.72	359.09	375.72		(73)
6. Solar gains:									
Solar gains are calculated using sola	r flux from Table 6a	and associated equa	ations to con	vert to the	e applicab	le orientat	ion.		
Orientation: Access Factor	Area	Flux		g_ -	_	FF		Gains	
Table 6d	m²	Table 6a	Ia	ble 6b	_ la	able 6c		(W)	_
South 0.9x 0.77 x	5.44	x 46.75	x	0.4	x	0.7	=	49.35	(78)
South 0.9x 0.77 x	4.8	x 46.75	x	0.4	_ x _	0.7	=	43.54	(78)
South 0.9x 0.77 x	5.44	x 76.57	x	0.4	x	0.7	=	80.82	(78)
South 0.9x 0.77 x	4.8	x 76.57	х	0.4	_ x _	0.7	=	71.31	(78)

	_					_			,			_				
South	0.9x	0.77		X	5.44	X	9	7.53	X		0.4	X	0.7	=	102.95	(78)
South	0.9x	0.77		X	4.8	X	9	7.53	X		0.4	X	0.7	=	90.84	(78)
South	0.9x	0.77		X	5.44	X	1	10.23	X		0.4	X	0.7	=	116.36	(78)
South	0.9x	0.77		X	4.8	X	1	10.23	X		0.4	X	0.7	=	102.67	(78)
South	0.9x	0.77		X	5.44	X	1	14.87	X		0.4	X	0.7	=	121.26	(78)
South	0.9x	0.77		X	4.8	X	1	14.87	X		0.4	X	0.7	=	106.99	(78)
South	0.9x	0.77		X	5.44	X	1	10.55	X		0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77		X	4.8	X	1	10.55	X		0.4	X	0.7	=	102.96	(78)
South	0.9x	0.77		X	5.44	X	1	08.01	X		0.4	X	0.7	=	114.01	(78)
South	0.9x	0.77		X	4.8	x	1	08.01	X		0.4	X	0.7	=	100.6	(78)
South	0.9x	0.77		X	5.44	X	1	04.89	X		0.4	X	0.7	=	110.72	(78)
South	0.9x	0.77		X	4.8	X	1	04.89	X		0.4	X	0.7	=	97.7	(78)
South	0.9x	0.77		X	5.44	x	1	01.89	x		0.4	X	0.7	=	107.55	(78)
South	0.9x	0.77		X	4.8	X	1	01.89	X		0.4	X	0.7	=	94.9	(78)
South	0.9x	0.77		X	5.44	x	8	2.59	x		0.4	X	0.7	=	87.18	(78)
South	0.9x	0.77		X	4.8	x	8	2.59	x		0.4	X	0.7	=	76.92	(78)
South	0.9x	0.77		X	5.44	×	5	5.42	x		0.4	X	0.7	=	58.5	(78)
South	0.9x	0.77		X	4.8	X	5	5.42	Х		0.4	X	0.7	=	51.62	(78)
South	0.9x	0.77		X	5.44	x		40.4	x		0.4	X	0.7		42.64	(78)
South	0.9x	0.77		х	4.8	х		40.4] x		0.4	X	0.7	=	37.63	(78)
West	0.9x	0.77		X	1.44	X	1	9.64	x		0.4	X	0.7	=	5.49	(80)
West	0.9x	0.77		х	1.44	x	3	8.42	Х		0.4	X	0.7	=	10.74	(80)
West	0.9x	0.77		х	1.44	X	6	3.27	x		0.4	X	0.7	=	17.68	(80)
West	0.9x	0.77		х	1.44	×	9	2.28	x		0.4	X	0.7	=	25.78	(80)
West	0.9x	0.77		X	1.44	×	1	13.09	x		0.4	X	0.7	=	31.6	(80)
West	0.9x	0.77		X	1.44	x	1	15.77	X		0.4	X	0.7	=	32.35	(80)
West	0.9x	0.77		X	1.44	x	1	10.22	X		0.4	X	0.7	=	30.8	(80)
West	0.9x	0.77		X	1.44	x	9	4.68	X		0.4	X	0.7	=	26.45	(80)
West	0.9x	0.77		X	1.44	×	7	3.59	X		0.4	X	0.7	=	20.56	(80)
West	0.9x	0.77		X	1.44	×	4	5.59	x		0.4	X	0.7	=	12.74	(80)
West	0.9x	0.77		X	1.44	x	2	4.49	X		0.4	X	0.7	=	6.84	(80)
West	0.9x	0.77		X	1.44	x	1	6.15	X		0.4	X	0.7	=	4.51	(80)
Solar	ains in	watts, ca	lculate	ed	for each mo	nth_		•	÷÷		um(74)m .	<u> </u>			-	
(83)m=	98.38	162.87	211.48		244.82 259.		252	245.41	234	.88	223.01	176.8	33 116.95	84.78		(83)
_				_	(84)m = (73)		• ,								7	
(84)m=	483.97	546.46	583.01		597.03 592	6	565.95	547.11	542	.17	540.21	513.	476.04	460.5		(84)
7. Me	an inter	nal temp	eratur	e (heating seas	on)										
Temp	erature	during he	eating	ре	eriods in the	living	area '	from Tab	ole 9	, Th′	1 (°C)				21	(85)
Utilisa	ation fac			$\overline{}$	ving area, h1	,m (see Ta	ble 9a)							- -	
	Jan	Feb	Mar	_	Apr Ma	Ť	Jun	Jul	_	ug	Sep	Oc		Dec	_	
(86)m=	0.99	0.98	0.95		0.87 0.73	3	0.53	0.38	0.	4	0.6	0.87	0.98	0.99		(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.46 20.6 20.75 20.9 20.98 21 21 21 21 20.92 20.68 20.44] ((87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.3 20.3 20.31 20.32 20.32 20.34 20.34 20.34 20.33 20.32 20.32 20.31		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.99 0.97 0.94 0.85 0.69 0.48 0.32 0.34 0.55 0.84 0.97 0.99] ((89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_	
(90)m= 19.59 19.78 20 20.21 20.3 20.34 20.34 20.34 20.33 20.24 19.91 19.57] ((90)
fLA = Living area ÷ (4) =	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
(92)m= 19.95 20.12 20.31 20.49 20.58 20.61 20.61 20.61 20.6 20.51 20.22 19.93] ((92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_	
(93)m= 19.95 20.12 20.31 20.49 20.58 20.61 20.61 20.61 20.6 20.51 20.22 19.93	((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 the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.97 0.94 0.85 0.7 0.5 0.35 0.36 0.57 0.85 0.97 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m	,	(05)
(95)m= 478.03 531.01 546.14 508.99 416.97 282.7 189.08 197.69 307.5 435.41 460.88 456.21] ((95)
Monthly average external temperature from Table 8	٦	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2]	(96)
Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m-(96)m] (97)m= 781.5 756.76 683.76 561.84 428.36 283.46 189.12 197.75 309.53 478.39 638.89 772.12		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$] `	(0.)
(98)m= 225.78 151.71 102.38 38.05 8.48 0 0 0 0 31.98 128.16 235.04	1	
Total per year (kWh/year) = Sum(98) _{15,912} =	921.58	(98)
Space heating requirement in kWh/m²/year	13.75	(99)
	10.10	
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	the latter	
Fraction of heat from Community boilers	1 ((303a)
Fraction of total space heat from Community boilers (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 ((305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	
Annual space heating requirement	921.58	

Space heat from Community boilers		(98) x (304a) x	(305) x (306) =	967.66	(307a)
Efficiency of secondary/supplementary he	eating system in % (from Ta			0](308
Space heating requirement from secondary	,	(98) x (301) x 1	,	0](309)
	ary/supplementary system	(00) X (001) X 1	00 : (000) =	0](000)
Water heating Annual water heating requirement				1791.08	1
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	1880.63	(310a)
Electricity used for heat distribution	(0.01 × [(307a)(307	(e) + (310a)(310e)] =	28.48	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling s	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extrac		de		119.54	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b	b) + (330g) =	119.54	(331)
Energy for lighting (calculated in Appendi	ix L)	_		315.44	(332)
Total delivered energy for all uses (307) -	+ (309) + (310) + (312) + (3	15) + (331) + (33	22) (227b) –	3283.28	(338)
Total delivered energy for all abes (667)	. (0.0) . (0.12) . (0	10) 1 (001) 1 (00	32)(237b) =	3203.20	(330)
12b. CO2 Emissions – Community heating	ng scheme	Energy kWh/year	Emission factor kg CO2/kWh		(330)
	ng scheme	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating CO2 from other sources of space and was	ng scheme Iter heating (not CHP) If there is CHP using two forms	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and was Efficiency of heat source 1 (%)	ng scheme Iter heating (not CHP) If there is CHP using two forms	Energy kWh/year fuels repeat (363) to 0] x 100 ÷ (367b) x	Emission factor kg CO2/kWh	Emissions kg CO2/year](367a)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1	ng scheme Inter heating (not CHP) If there is CHP using two for (307b)+(310b) [(313)	Energy kWh/year fuels repeat (363) to 0] x 100 ÷ (367b) x	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	Emissions kg CO2/year](367a)](367)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Inter heating (not CHP) If there is CHP using two for [(307b)+(310b)] [(313) stems (363).	Energy kWh/year fuels repeat (363) to 0] x 100 ÷ (367b) x x (366) + (368)(372	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	95 647.61 14.78 662.39](367a)](367)](372)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy	Inter heating (not CHP) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(313)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(307b)+(310b)+(310b)] [(307b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b	Energy kWh/year fuels repeat (363) to 0] x 100 ÷ (367b) x x (366) + (368)(372	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52	95 647.61 14.78 662.39](367a)](367)](372)](373)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second	Inter heating (not CHP) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(313) If there is CHP using two for [(307b)+(310b)] [(307b)+(310b)+(310b)] [(307b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)+(310b)	Energy kWh/year fuels repeat (363) to 0] x 100 ÷ (367b) x x (366) + (368)(372	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	95 647.61 14.78 662.39](367a)](367)](372)](373)](374)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second CO2 associated with water from immersions)	atter heating (not CHP) If there is CHP using two for [(307b)+(310b)] [(313) It is stems (363). It is on heater or instantaneous inter heating (373)	Energy kWh/year fuels repeat (363) to 1] x 100 ÷ (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) =	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	95 647.61 14.78 662.39 0 662.39](367a)](367)](372)](373)](374)](375)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second CO2 associated with water from immersion Total CO2 associated with space and was compared to the control of t	atter heating (not CHP) If there is CHP using two for [(307b)+(310b) [(313) stems (363). and fans within dwelling (373)	Energy kWh/year fuels repeat (363) to (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) =	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22	95 647.61 14.78 662.39 0 662.39](367a)](367)](372)](373)](374)](375)](376)
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			User [Details:						
Assessor Name: Software Name:	Stroma FSAP	2012		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	: Sampl	e 4 (Mid)			
Address :										
1. Overall dwelling dimer	nsions:		A	- (2\		A., 11a	! a.l. 4/.a.\		Value of m	2)
Ground floor			Are	a(m²) 67	(1a) x	Av. ne	gight(m)	(2a) =	Volume(m	3) (3a
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+	-(1e)+(1r	า)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	ry □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	.ır (6a
•			_]		=	20 =		= '
Number of open flues		0	」 ' L	0] ⁻	0			0	(6b)
Number of intermittent fan	1S				Ĺ	2		10 =	20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fire	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimney	e flues and fans -	- (6a)+(6b)+(7	7a)+(7h)+((7c) =	Г		_	÷ (5) =		(8)
If a pressurisation test has be					continue f	20 rom (9) to		÷ (5) =	0.1	(0)
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11
if both types of wall are pre deducting areas of opening		orresponding to	the grea	ter wall are	a (atter					
If suspended wooden flo		sealed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter	. 0							0	(13
Percentage of windows	and doors draugh	nt stripped							0	(14
Window infiltration				0.25 - [0.2	. ,	-	(45)		0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, or If based on air permeabilit				•	•	ietre oi e	envelope	area	5	(17
Air permeability value applies	-					is being u	ısed		0.35	(18
Number of sides sheltered					·	J			2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wind sp	eed			1	,	,		7	
Jan Feb I	Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7					_			_	
(22)m= 5.1 5	4.9 4.4 4.3	3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (22	m ÷ 4									
	.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
, ,							<u> </u>		J	

Adjusted infiltra	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	0.27	0.3	0.32	0.33	0.35		
Calculate effec		_	rate for t	he appli	cable ca	se							
If mechanica							.=					0	(23
If exhaust air he) = (23a)			0	(23
If balanced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	entilation	without	heat rec	overy (N	/IV) (24b	m = (22)	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n				•	•				0.5]	<u>!</u>			
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		(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) 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
2 Heat lease	and b	oʻ loog	0 0 11 0 120 0 1										
3. Heat losse ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
)oo <mark>rs</mark>	G.: 3 G.	()	, i		2.4	×	1	=	2.4		,,,,,,		(26
Vin <mark>dows</mark> Type	1				1.44		 /[1/(1.4)+		1.91	Ħ			(27
Vindows Type					5.44		/[1/(1.4)+		7.21	Б			(27
Vindows Type	: 3				4.8	x1	/[1/(1.4)+	0.04] =	6.36				(27
Valls Type1	31.	7	10.2	4	21.46	x	0.18	=	3.86				(29
Valls Type2	19		1.44		17.56	x	0.18	=	3.16	\neg			(29
Valls Type3	11.	1	2.4		8.7	X	0.18	=	1.57	₹ i		$\neg \sqcap$	(29
Valls Type4	2.4		0		2.4	x	0.18	=	0.43	₹ i		7	(29
otal area of e	lements	, m²			64.2								(31
for windows and * include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	3.2	
abric heat los	s, W/K	= S (A x	U)	,			(26)(30)	+ (32) =				26.9	(3:
leat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	701.6	
hermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		`
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						3.21	(36
details of thermatorial fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			30.12	2 (37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ([25)m x (5])		,
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 37.92	37.74	37.56	36.71	36.55	35.81	35.81	35.67	36.09	36.55	36.87	37.21		(38
leat transfer of	nefficie	nt \N/K						(39)m	= (37) + (38)m		ı	
			00.00	00.00	65.92	05.00	65.79	66.21	66.66	66.99	67.32	1	
39)m= 68.04	67.85	67.67	66.82	66.66	05.97	65.92	1 00.79	00.21	ממ.מס	פא.מס ו	1 07.37		

eat lo	ss para	meter (F	ILP), W/	m²K			•		(40)m	= (39)m ÷	(4)			
0)m=	1.02	1.01	1.01	1	0.99	0.98	0.98	0.98	0.99	0.99	1	1		
umba	r of dov	a in mar	sth /Tabl	0 10)					,	Average =	Sum(40) ₁	.12 /12=	1	(4
umbe T	Jan	Feb	nth (Tabl Mar		May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec		
1)m=	31	28	31	Apr 30	31	30	31	Aug 31	30 30	31	30	31		(4
' <i>,</i> ''.'- L			01		01			<u> </u>				01		(.
I. Wat	ter heat	ing ener	gy requi	rement:								kWh/yea	r:	
	od ooou	nonov N	.1											
if TF			ч + 1.76 х	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.	.9)	17		(4
duce t	the annua	l average	iter usag hot water i person per	usage by t	5% if the d	lwelling is	designed t			se target o	85	.76		(4
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t wate			day for ea		,			_	ССР		1107			
l)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
											m(44) ₁₁₂ =		1029.18	(4
ergy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
)m= [139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
nstanta	aneous w	ater heatir	ng at point	of use (no	hot water	storage)	enter 0 in	hoxes (46		Total = Su	m(45) ₁₁₂ =		1349.41	(-
_	20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(4
	storage		10.34	10.51	13.04	13.07	12.07	14.54	14.71	17.13	10.72	20.32		(
orage	e volum	e (litres)	includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(
comn	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	r (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage		olorod k	ooo footo	r io kno		2/dox4):							,
			eclared lo		or is kno	wn (Kvvr	i/day):				1.3			(•
			m Table					(40) (40)			0.			(•
•			storage, clared c	-		or is not		(48) x (49)) =		0.	75		(
			factor from	•)		(
	-	•	ee sectio	on 4.3										
		from Tal									()		(
mpe	rature fa	actor fro	m Table	2b)		(
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	()		(
,	. , ,	54) in (5	•								0.	75		(
ater s	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
ylinde	r contains	dedicated	d solar stor	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendix	Н	
)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
mary	circuit	loss (an	nual) fro	m Table	3							0		(
-		•	culated f			59)m = ((58) ÷ 36	65 × (41)	m					
	lified by	factor fr	om Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(mod	illed by	140101 11	<u> </u>						<u> </u>					

Combi loss calculated for each month (61)m = (60)
(62) 186.5 164.43 172.86 155.17 152.22 136.24 131.06 143.52 143.17 160.9 169.86 182.09 (62)
(62) 186.5 164.43 172.86 155.17 152.22 136.24 131.06 143.52 143.17 160.9 169.86 182.09 (62)
Casima C
(63) m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Firss 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater (64)m= 186.5 164.45 172.86 155.17 152.22 136.24 131.06 143.52 143.17 160.9 169.86 182.09 Output from water heating, kWh/month 0.25 [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 83.79 74.35 79.26 72.68 72.4 66.38 65.36 69.5 68.68 75.28 77.56 82.33 (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). Watts Metabolic gains (Table 5), Watts Metabolic gains (Calculated in Appendix L, equation L9 or L9a), also see Table 5 (66) Lighting gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (67) 17.41 15.46 12.58 9.52 7.12 6.01 6.49 8.44 11.33 14.38 16.79 17.89 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 190.2 192.17 187.2 176.61 163.24 15.06.8 142.29 143.32 145.29 155.88 169.24 181.8 (68) Cooking gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 190.2 192.17 187.2 176.61 163.24 15.06.8 142.29 143.32 145.29 155.88 169.24 181.8 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (68)m= 190.2 192.17 187.2 176.61 163.24 15.06.8 13.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69) Pumps and fans gains (Table 5) (71)m= 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86.85 86
(64)m=
Output from water heater (annual) 1898.03 (64) Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 83.79 74.35 79.26 72.68 72.46 63.8 65.36 69.5 68.68 75.28 77.56 82.33 (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 = 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 1
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m = 83.79
(65)me 83.79 74.35 79.26 72.68 72.4 66.38 65.36 69.5 68.68 75.28 77.56 82.33 (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 Metabolic gains (Table 5), Matts (Table 5) Metabolic gains (Table 5), Matts
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 (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.41 15.46 12.58 9.52 7.12 6.01 6.49 8.44 11.33 14.38 16.79 17.89 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 190.2 192.17 187.2 176.61 163.24 150.68 142.29 140.32 145.29 155.88 169.24 181.8 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(67) (67) (67) (67) (67) (67) (67) (67)
(67) (67) (67) (67) (67) (67) (67) (67)
(68)m= 190.2 192.17 187.2 176.61 163.24 150.68 142.29 140.32 145.29 155.88 169.24 181.8 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(69) m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69) Pumps and fans gains (Table 5a) (70) m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(69) m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69) Pumps and fans gains (Table 5a) (70) m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(71)m=
Water heating gains (Table 5) (72)m= 112.63 110.65 106.53 100.94 97.31 92.19 87.85 93.42 95.4 101.18 107.72 110.65 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 378.8 376.85 364.87 345.64 326.23 307.45 295.2 300.74 310.58 330.01 352.32 368.92 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(72)m= 112.63 110.65 106.53 100.94 97.31 92.19 87.85 93.42 95.4 101.18 107.72 110.65 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 378.8 376.85 364.87 345.64 326.23 307.45 295.2 300.74 310.58 330.01 352.32 368.92 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(72)m= 112.63 110.65 106.53 100.94 97.31 92.19 87.85 93.42 95.4 101.18 107.72 110.65 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 378.8 376.85 364.87 345.64 326.23 307.45 295.2 300.74 310.58 330.01 352.32 368.92 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(73)m= 378.8 376.85 364.87 345.64 326.23 307.45 295.2 300.74 310.58 330.01 352.32 368.92 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(73)m= 378.8 376.85 364.87 345.64 326.23 307.45 295.2 300.74 310.58 330.01 352.32 368.92 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux a FF Gains
5–
Table 6d m² Table 6a Table 6b Table 6c (W)
South 0.9x 0.77 x 5.44 x 46.75 x 0.63 x 0.7 = 77.73 (78)
South 0.9x 0.77 x 4.8 x 46.75 x 0.63 x 0.7 = 68.58 (78)
South 0.9x 0.77 x 5.44 x 76.57 x 0.63 x 0.7 = 127.3 (78)
South 0.9x 0.77 x 4.8 x 76.57 x 0.63 x 0.7 = 112.32 (78)

	_	South 0.9x 0.77 x 5.44 x 97.53 x 0.63 x 0.7 = 162.15 (78)												_		
South	0.9x	0.77)	ا :	5.44	X	9	7.53	X		0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77	>		4.8	X	9	7.53	X		0.63	X	0.7	=	143.08	(78)
South	0.9x	0.77	>		5.44	X	1	10.23	X		0.63	X	0.7	=	183.27	(78)
South	0.9x	0.77)		4.8	×	1	10.23	X		0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77)		5.44	X	1	14.87	X		0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77)		4.8	X	1	14.87	X		0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77)		5.44	X	1	10.55	X		0.63	X	0.7	=	183.79	(78)
South	0.9x	0.77)		4.8	×	1	10.55	x		0.63	X	0.7	=	162.17	(78)
South	0.9x	0.77)		5.44	X	10	08.01	X		0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77)		4.8	X	10	08.01	X		0.63	X	0.7	=	158.45	(78)
South	0.9x	0.77)		5.44	×	10	04.89	x		0.63	X	0.7	=	174.39	(78)
South	0.9x	0.77)		4.8	×	10	04.89	x		0.63	X	0.7	=	153.87	(78)
South	0.9x	0.77)		5.44	x	10	01.89	x		0.63	X	0.7	=	169.39	(78)
South	0.9x	0.77)		4.8	×	10	01.89	x		0.63	X	0.7	=	149.46	(78)
South	0.9x	0.77)		5.44	X	8	2.59	x		0.63	x	0.7	=	137.3	(78)
South	0.9x	0.77)		4.8	X	8	2.59	X		0.63	x	0.7	=	121.15	(78)
South	0.9x	0.77	>		5.44	×	5	5.42	x		0.63	X	0.7	=	92.13	(78)
South	0.9x	0.77)		4.8	X	5	5.42	Х		0.63	X	0.7	=	81.29	(78)
South	0.9x	0.77)		5.44	х		40.4	x		0.63	X	0.7	=	67.16	(78)
South	0.9x	0.77)		4.8	х		40.4	_ x		0.63	X	0.7	=	59.26	(78)
West	0.9x	0.77)		1.44	X	1	9.64	x		0.63	X	0.7	=	8.64	(80)
West	0.9x	0.77	—		1.44	X	3	8.42	Х		0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77	/		1.44	x	6	3.27	X		0.63	x	0.7	=	27.85	(80)
West	0.9x	0.77)		1.44	×	9	2.28	x		0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77)		1.44	X	1	13.09	x		0.63	X	0.7	=	49.77	(80)
West	0.9x	0.77)		1.44	X	1	15.77	x		0.63	x	0.7	=	50.95	(80)
West	0.9x	0.77)		1.44	x	1	10.22	x		0.63	X	0.7	=	48.51	(80)
West	0.9x	0.77)		1.44	×	9	4.68	x		0.63	x	0.7	=	41.67	(80)
West	0.9x	0.77)		1.44	×	7	3.59	x		0.63	X	0.7	=	32.39	(80)
West	0.9x	0.77)		1.44	X	4	5.59	X		0.63	X	0.7	=	20.06	(80)
West	0.9x	0.77)		1.44	×	2	4.49	x		0.63	x	0.7	=	10.78	(80)
West	0.9x	0.77)		1.44	×	1	6.15	x		0.63	X	0.7	=	7.11	(80)
West 0.9x 0.77 x 1.44 x 16.15 x 0.63 x 0.7 = 7.11 (80)																
-	$\overline{}$			_	or each mon	_			`	_	ım(74)m .	<u> </u>			1	
(83)m=	154.95	256.53	333.08		385.59 409.2		396.91	386.53	369	.93	351.23	278.5	1 184.2	133.53		(83)
_				Ť	$\frac{(84)m = (73)r}{1}$	_	` '			ı			<u> </u>		1	(0.1)
(84)m= 533.75 633.37 697.95 731.22 735.49 704.36 681.72 670.67 661.81 608.52 536.52 502.45 (84)																
7. Mean internal temperature (heating season)																
Temperature during heating periods in the living area from Table 9, Th1 (°C)																
Utilisation factor for gains for living area, h1,m (see Table 9a)																
	Jan	Feb	Mar	\downarrow	Apr Ma	` 	Jun	Jul	_	ug	Sep	Oc	+	Dec	ļ	
(86)m=	0.99	0.98	0.95		0.89 0.77		0.59	0.42	0.4	15	0.66	0.9	0.98	0.99]	(86)

Magn internal temperature in living area T1 (follow stone 2 to 7 in Table 0a)									
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.13 20.32 20.54 20.77 20.92 20.99 21 21 20.97 20.79 20.42	20.09 (87)								
(87)m= 20.13 20.32 20.54 20.77 20.92 20.99 21 21 20.97 20.79 20.42 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	20.09								
(88)m= 20.07 20.07 20.07 20.09 20.09 20.1 20.1 20.1 20.09 20.09 20.08	20.08 (88)								
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)									
(89)m= 0.99 0.97 0.94 0.86 0.71 0.51 0.34 0.36 0.59 0.87 0.97	0.99 (89)								
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)									
(90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35	18.88 (90)								
fLA = Living area ÷ (4	4) = 0.41 (91)								
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$									
(92)m= 19.41 19.66 19.94 20.22 20.38 20.45 20.46 20.46 20.44 20.24 19.78	19.37 (92)								
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	<u> </u>								
(93)m= 19.41 19.66 19.94 20.22 20.38 20.45 20.46 20.46 20.44 20.24 19.78	19.37 (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 the utilisation factor for gains using Table 9a	d re-calculate								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec								
Utilisation factor for gains, hm:									
(94)m= 0.99 0.97 0.94 0.86 0.73 0.54 0.37 0.4 0.62 0.87 0.97	0.99 (94)								
Useful gains, hmGm , W = (94)m x (84)m									
(95)m= 526.96 614.3 653.04 631.25 538.97 380.19 254.12 266.52 407.67 530.57 520.93	497.63 (95)								
Monthly average external temperature from Table 8									
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2 (96)								
Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m- (96)m]									
(97)m= 1028.38 1001.43 909.31 756.12 578.96 385.93 254.7 267.36 419.79 642.71 849.7	1021.36 (97)								
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m									
(98)m= 373.06 260.15 190.66 89.9 29.75 0 0 0 83.43 236.71	389.66								
Total per year (kWh/year) = Sum(98	8) _{15,912} = 1653.33 (98)								
Space heating requirement in kWh/m²/year	24.68 (99)								
9a. Energy requirements – Individual heating systems including micro-CHP)									
Space heating:									
Fraction of space heat from secondary/supplementary system	0 (201)								
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)								
Fraction of space heat from main system(s) $ (202) = 1 - (201) = 1 $ Fraction of total heating from main system 1 $ (204) = (202) \times [1 - (203)] = 1 $ Efficiency of main space heating system 1 $ 93.5 $									
Efficiency of main space heating system 1	93.5 (206)								
Efficiency of secondary/supplementary heating system, %	0 (208)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec kWh/year								
Space heating requirement (calculated above)									
373.06 260.15 190.66 89.9 29.75 0 0 0 0 83.43 236.71	389.66								
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)								
398.99 278.24 203.92 96.15 31.82 0 0 0 0 89.23 253.17	416.74								
Total (kWh/year) =Sum(211) _{15,1012}	1768.27 (211)								

Space heating for	ıel (seconda	ry), kWh/	month									
$= \{[(98) \text{m x } (201)]$	•	• .										
(215)m= 0	0 0	0	0	0	0	0	0	0	0	0		
		-			_	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	"II	0	(215)
Water heating												
Output from wate	heater (cal		oove) 152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		
Efficiency of wate		155.17	102.22	130.24	131.00	143.32	143.17	160.9	109.00	102.09	79.8	(216)
	5.03 85.08	83.42	81.37	79.8	79.8	79.8	79.8	83.16	85.7	86.79	79.0	(217)
Fuel for water he			0	. 0.0	. 0.0	. 0.0	. 0.0	000	00	000		()
(219)m = (64)m	-				•							
(219)m= 215.29 19	1.15 203.19	186.02	187.07	170.73	164.23	179.84	179.41	193.48	198.21	209.79		_
						Tota	I = Sum(2				2278.4	(219)
Annual totals Space heating fu	dused mair	n evetem	1					k'	Wh/yeaı	•	kWh/year	¬
		i systeiii	1								1768.27	╡
Water heating fuel used 2278.4												
Electricity for pun	ps, fans and	d electric	keep-ho	t								
central heating p	ump:									30		(230c)
boiler with a fan-	assisted flue	9								45		(230e)
Total electricity fo	r the above,	kWh/yea	r			sum	of (230a).	(2 30g) =			75	(231)
Electricity for light	ing										307.48	(232)
Tota <mark>l deli</mark> vered er	ergy for all	uses (211)(221)	+ (231)	+ (232).	(237b)	=				4429.15	(338)
12a. CO2 emiss	ons – Indivi	dual heat	ing syste	ms inclu	uding mi	cro-CHP						
				En	ergy /h/year			Emiss kg CO:	ion fac	tor	Emissions	
Space heating (m	ain system ⁻	1)			1) x			0.2		=	381.95	(261)
Space heating (se		5) x			0.5		=	0	(263)			
Water heating	(219	9) x			0.2		=	492.13	(264)			
Space and water	(26	1) + (262)	+ (263) + (264) =				874.08	(265)			
Electricity for pun	ps, fans and	t (23°	1) x			0.5	19	=	38.93	(267)		
Electricity for ligh	ing	(232	2) x			0.5	19	=	159.58	(268)		
Total CO2, kg/yea	ar						sum o	f (265)(2	271) =		1072.59	(272)

TER =

(273)

16.01

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height:

Floor 0 67 m^2 3 m

27.5 m² (fraction 0.41) Living area:

Unspecified Front of dwelling faces:

Opening types:

Nan	ne:	Source:		Type:	Glazing:		Argon:	Frame:
DOO	R	<u>Manuf</u> actı	ırer	Solid				Wood
Ε		Manufactu	ırer	Windows	low-E, $En = 0.0$	5, soft coat	No	
Balco	ny	Manufactu	ırer	Windows	low-E, $En = 0.0$	5, soft coat	No	

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
E		E	East	0	0
Balcony		E	East	0	0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
E	29.4	8.96	20.44	0.15	0	False	N/A
INT	12	2.4	9.6	0.16	0.43	False	N/A
Spandrel	2.44	0	2.44	0.35	0	False	N/A
Internal Floment	c						

<u>Internal Elements</u> Party Elements

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Yes (As designed) Pressure test:

SAP Input

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Dwelling volume 2. Ventilation rate: main secondary other total m³ per hour				User [Details:						
Address: 1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³)		Stroma FSAP 20	12						Versio	on: 1.0.5.51	
Area(m²)			Р	roperty	Address	: Sampl	e 5 (Mid)			
Strout S											
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)	Overall dwelling dimer	Stroma FSAP 2012 Software Version: Version: 1.0.5.51									
Develling volume Cash+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)	Ground floor			Are		(1a) x	Av. ne		(2a) =		<u> </u>
Number of chimneys	Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	۱)	67	(4)					
Number of chimneys	Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
Number of chimneys	2. Ventilation rate:										
Number of open flues 0	Number of chimneys	heating	heating	· 		7 <u>-</u> F			40 =	-	_
Number of intermittent fans Number of passive vents \[0 \text{x10} = 0 \] Number of flueless gas fires \[\text{value} = 0 \] Infiltration due to chirmneys, flues and fans = \(\left(\text{s0} \right) + (fb) + (fb) + (fb) \right) = 0 \] Infiltration due to chirmneys, flues and fans = \(\left(\text{s0} \right) + (fb) + (fb) + (fb) + (fb) \right) = 0 \] Infiltration due to chirmneys, flues and fans = \(\left(\text{s0} \right) + (fb) + (fb) + (fb) + (fb) \right) = 0 \] Infiltration due to chirmneys, flues and fans = \(\left(\text{s0} \right) + (fb) + (fb) + (fb) + (fb) + (fb) \right) = 0 \] Infiltration due to chirmneys, flues and fans = \(\left(\text{s0} \right) + (fb) + (fb) + (fb) + (fb) \right) = 0 \] Infiltration due to chirmneys, flues and fans = \(\left(\text{s0} \right) + (fb) + (fb) + (fb) + (fb) \right) = 0 \] Additional infiltration in 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 Percentage of windows and doors draught stripped Window infiltration \[0.25 - \left(0.2 \times (14) + 100 \right) = 0 \] Infiltration rate Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 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, q50, expressed in cubic metres per hour per square metre of envelope area 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, q50, expressed in cubic metres per hour per square metre of envelope area if based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area if based on air per	•			╛╘		_					╡`
Number of passive vents 0	·		0	」 [†]	0	」 [■]	0			0	(6b
Number of flueless gas fires 0	Number of intermittent fan	S				L	0	X	10 =	0	(7a
Air changes per hour Infiltration due to chimneys, flues and fans = (60)+(6b)+(7a)+(7b)+(7c) =	Number of passive vents						0	X	10 =	0	(7b)
Infiltration due to chimneys, flues and fans = (6e)+(6b)+(7e)+(7e)+(7e)+(7e)+(7e)+(7e)+(7e)+(7e	Number of flueless gas fire	es					0	X	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: 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 Percentage of windows and doors draught stripped Window infiltration Output Vindow infiltration Output Outp									Air ch	nanges per h	our
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: 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 Percentage of windows and doors draught stripped Window infiltration 0.25 - [0.2 x (14) + 100] = 0 (0) Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 (0) 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 Shelter factor (20) = 1 - [0.075 x (19)] = 0.78 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 (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	Infiltration due to chimney	Stroma Number: Stroma FSAP 2012 Software Version: Version: 1.0.5.51									
Additional 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 0.25 - [0.2 × (14) ÷ 100] = 0 (a) + (10) + (11) + (12) + (13) + (15) = 0 (b) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (11) + (12) + (13) + (15) = 0 (c) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) + (10) +	If a pressurisation test has be	Stroma Number: Stroma FSAP 2012 Software Version: Version: 1.0.5.51									
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 Infiltration rate 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 Shelter factor (20) = 1 - [0.075 × (19)] = O.78 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 (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		e dw <mark>elling</mark> (ns)								0	_
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 Office the first of the suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 Percentage of windows and doors draught stripped Window infiltration Office the first of the suspended wooden floor, enter 0.0 (and the suspended wooden floor), else enter 0 Percentage of windows and doors draught stripped Window infiltration Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the first of the first of the suspended wooden floor and suspended wooden floor. Infiltration rate incorporating shelter factor Office the first of the first		OF for otaal or timber	t frame or	0.05 to				[(9)	-1]x0.1 =		= '
Section Sect						•	ruction			0	(11
If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration Infiltration rate 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 Shelter factor (20) = 1 - [0.075 × (19)] = Infiltration rate incorporating shelter factor (21) = (18) × (20) = 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 (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			operiumg te	ano grou	.cran are	a (a.co.					
Percentage of windows and doors draught stripped Window infiltration Infiltration rate 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 Shelter factor (20) = 1 - [0.075 x (19)] = Infiltration rate incorporating shelter factor (21) = (18) x (20) = 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 (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	•	•	•	.1 (seale	ed), else	enter 0				0	(12
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate incorporating shelter factor $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate modified for monthly wind speed $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m= $0.15 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] $	•									0	=
Infiltration rate Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, 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 $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 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 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$	ŭ	and doors draught s	stripped		0.25 [0.2	v (14) · ·	1001 -				=
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, 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 × (19)] = 0.78 Infiltration rate incorporating shelter factor (21) = (18) × (20) = 0.12 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 (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 \div 4					•	,	-	+ (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 $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 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 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$		150 expressed in cu	ihic metre	s ner hø					area		— (`
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)] = 0.78 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = (18) x (20) = 0.12 (21) = (18) x (20) = (18) x	•	•		•	•	•	ictic oi c	Silvelope	arca		=
Shelter factor (20) = 1 - [0.075 x (19)] = 0.78 (21) = (18) x (20) = 0.12 (21) = (18) x (20) x (20) = (18) x (20) = (1	•	-					is being u	ised		0.10	(
Infiltration rate incorporating shelter factor 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 (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 sides sheltered	d								3	(19
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 (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							19)] =			0.78	(20
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	•				(21) = (18) x (20) =				0.12	(21
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			i		1				1	7	
	Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind spe	ed from Table 7								-	
	$(22)m = \begin{bmatrix} 5.1 & 5 & 4 \end{bmatrix}$	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	Wind Factor (22a)m = (22)m ÷ 4									
		·	0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
alculate effe		•	rate for t	he appli	cable ca	se	•	•	•	•	•	<u>'</u>	<u> </u>
If mechanical If exhaust air he			andiv NI (C	12h) (22	a) [m, /	aguatian (I	NEN otho	muiaa (22h	\ (220\			0.5	(2
		0 11		, ,	,	. `	,, .	,) = (23a)			0.5	(2
If balanced with		•	-	_					21.) (001.) [4 (00 -)	79.05	(2
a) If balance				.		- ` ` 	, 	í `	 		```	÷ 100] I	(2
1a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	İ	(2
b) If balance					1		- ^ ` 	i `	 		Ι ,	1	10
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	j	(2
c) If whole h							on from (c) = (221		5 v (22h	.)			
1c)m= 0	0.5 7	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0	0	0	1	(2
,												İ	(2
d) If natural if (22b)n				•					0.5]				
1d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24k	b) or (24	c) or (24	d) in bo	к (25)	ļ.	ļ.	!	1	
5)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
. Heat losse									4 2/11				
LEMENT	Gros area		Openin		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
oors					2.4	x	1.4	= [3.36	7			(2
in <mark>dows</mark> Type	1				4.16	=	1/[1/(1)+	\	4	Ħ			(2
indows Type					4.8		1/[1/(1)+		4.62	Ħ			(2
alls Type1			0.00							╡ ,			`
• •	29.		8.96		20.44	=	0.15	=	3.07	ᆗ ¦			(2
alls Type2	12	_	2.4	_	9.6	X	0.15	=	1.44	亅 ¦		╡	(2
alls Type3	2.4		0		2.44	X	0.35	=	0.85	[_	(2
otal area of e					43.84								(3
or windows and include the area						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
abric heat los				is and par	uuons		(26)(30)) + (32) =				17.33	(3
eat capacity		,	O ,					((28)	(30) + (32	2) + (32a).	(32e) =	454.72	===
ermal mass		. ,	P = Cm -	- TFΔ) ir	n k.l/m²K				tive Value		(020) =	250	· · · · · · · · · · · · · · · · · · ·
r design assess	•	,		,			recisely the				able 1f	230	(
n be used inste				0077011.000			colocity and	, maroau v	74.400 0.				
nermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						6.58	(3
letails of therma		are not kn	own (36) =	= 0.05 x (3	31)								
tal fabric he	at loss							(33) +	(36) =			23.91	(3
entilation hea		i	monthly	y				(38)m	= 0.33 × (25)m x (5)) I	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 16.78	16.59	16.39	15.43	15.24	14.27	14.27	14.08	14.66	15.24	15.62	16.01		(3
								(30)m	= (37) + (3	30/m			
eat transfer o	oefficiei	nt, VV/K						(39)111	= (37) + (30)111			

Heat Id	ss para	meter (F	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.61	0.6	0.6	0.59	0.58	0.57	0.57	0.57	0.58	0.58	0.59	0.6		
Numba	r of dov	a in ma	oth /Tob	lo 1o\					1	Average =	Sum(40) ₁ .	12 /12=	0.59	(40)
numbe 	i	Feb	nth (Tab Mar		Mov	lup	Jul	Λιια	Sep	Oct	Nov	Dec		
(41)m=	Jan 31	28	31	Apr 30	May 31	Jun 30	31	Aug 31	30	31	Nov 30	31		(41)
(41)111=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
1 \\/o	tor boot	ing once	av roqui	romonti								kWh/ye	0.51	
4. VVa	ter neat	ing ener	gy requi	rement.								Kvvii/ye	ai.	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		17		(42)
Reduce	the annua	l average	hot water	usage by		welling is	designed t	(25 x N) to achieve		se target o		5.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres per	day for ea		Vd,m = fa	ctor from	Table 1c x		•					
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
Cnore .	antant of	hat water	used sel	aulated me	anthly 1	100 × Vd *		Tm / 2600			m(44) ₁₁₂ =		1029.18	(44)
								Tm / 3600		-				
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77 m(45) ₁₁₂ =	135.49	1349.41	(45)
lf inst <mark>ant</mark>	<mark>ane</mark> ous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		i otai = Su	III(43) ₁₁₂ =		1349.41	(40)
(46)m=	20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	storage													
								within sa	ame ves	sel		0		(47)
	-	_			•		litres in	(47) mbi boil	ars) ante	ar 'O' in <i>(</i>	(17)			
	storage		not wate	, (uno ii	ioidaco ii	iiotaiitai	10000 00	THE BOIL	oro, oric) III (71)			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
•			_	, kWh/ye				(48) x (49)) =		1	10		(50)
•				-	oss facto e 2 (kWl							00		(51)
		_	ee secti		C Z (KVVI	i/iiti G/GC	iy <i>)</i>				0.	.02		(31)
	•	from Tal									1.	03		(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter	(50) or (54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
lf cylinde	r contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendi	κH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
					,	•	` '	65 × (41)						
` 1								ng and a			<u> </u>			
(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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	n month	(62)n	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.18	172.29	181.54	163.58	160.9	144.64	139.74	152.	2 151.57	169.58	178.26	190.77		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribu	tion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	18.03	16.04	16.49	14.58	14.03	12.18	11.28	12.9	4 13.08	15.09	16.32	17.54		(63) (G2)
Output	t from wa	ater hea	ter										_	
(64)m=	174.47	153.83	162.37	146.4	144.19	129.86	125.78	136.	58 135.89	151.81	159.35	170.55		_
								(Output from w	ater heate	er (annual)	112	1791.08	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	90.74	80.63	86.21	79.4	79.34	73.1	72.31	76.4	5 75.41	82.23	84.28	89.27		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelli	ng or hot w	vater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.5	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	n <mark>g g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	^r L9a), a	lso se	e Table 5					
(67)m=	18.93	16.81	13.67	10.35	7.74	6.53	7.06	9.17	12.31	15.63	18.25	19.45		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.3	32 145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)), alsc	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.8	6 33.86	33.86	33.86	33.86		(69)
Pumps	s and far	ns gains	(Table 5	āa)									_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					_		_	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.8	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	121.96	119.98	115.87	110.27	106.64	101.53	97.18	102.7	75 104.73	110.52	117.06	119.99		(72)
Total i	internal	gains =	1			(66)	m + (67)m	ı + (68)	m + (69)m +	(70)m + (7	71)m + (72))m		
(73)m=	386.65	384.53	372.3	352.8	333.19	314.31	302.1	307.8	317.9	337.6	360.11	376.81		(73)
6. So	lar gains	S:												
	-		•	r flux from	Table 6a		-	tions to	convert to the	he applica		tion.		
Orient	ation: A	Access F Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
East	0.9x	0.77	X	4.1	6	x 1	9.64	x	0.4	x	0.7	=	15.85	(76)
East	0.9x	0.77	x	4.	8	x 1	9.64	х	0.4	×	0.7	<u> </u>	18.29	(76)
East	0.9x	0.77	x	4.1	6	x 3	8.42	x	0.4	x [0.7	=	31.01	(76)
East	0.9x	0.77	х	4.	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(76)
	<u>L</u>		•	•										_

East	0.9x	0.77	X	4.16	X	6	3.27	X	0.4	X	0.7	=	= [51.07	(76)
East	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	X	0.7	=	= [58.93	(76)
East	0.9x	0.77	X	4.16	X	9	2.28	X	0.4	X	0.7	-	= [74.49	(76)
East	0.9x	0.77	X	4.8	X	9	2.28	X	0.4	X	0.7		- [85.95	(76)
East	0.9x	0.77	x	4.16	X	1	13.09	X	0.4	X	0.7		= [91.29	(76)
East	0.9x	0.77	X	4.8	X	1	13.09	X	0.4	X	0.7		- [105.33	(76)
East	0.9x	0.77	x	4.16	X	1	15.77	x	0.4	X	0.7		<u> </u>	93.45	(76)
East	0.9x	0.77	x	4.8	X	1	15.77	x	0.4	X	0.7		- [107.83	(76)
East	0.9x	0.77	X	4.16	X	1	10.22	x	0.4	x	0.7	-	= [88.97	(76)
East	0.9x	0.77	x	4.8	X	1	10.22	x	0.4	X	0.7	-	= [102.66	(76)
East	0.9x	0.77	X	4.16	X	9	4.68	x	0.4	X	0.7	-	<u> </u>	76.42	(76)
East	0.9x	0.77	x	4.8	X	9	4.68	X	0.4	X	0.7		- [88.18	(76)
East	0.9x	0.77	x	4.16	X	7	3.59	x	0.4	X	0.7		<u> </u>	59.4	(76)
East	0.9x	0.77	x	4.8	X	7	3.59	x	0.4	X	0.7		- [68.54	(76)
East	0.9x	0.77	x	4.16	X	4	5.59	X	0.4	X	0.7		= [36.8	(76)
East	0.9x	0.77	x	4.8	X	4	5.59	x	0.4	X	0.7		= [42.46	(76)
East	0.9x	0.77	x	4.16	X	2	4.49	x	0.4	X	0.7		- [19.77	(76)
East	0.9x	0.77	x	4.8	X	2	4.49	Х	0.4	X	0.7	-	- [22.81	(76)
East	0.9x	0.77	x	4.16	x	1	6.15	x	0.4	x	0.7		- [13.04	(76)
East	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	X	0.7		= [15.04	(76)
								7		_			_		
Solar g	ains in	watts, <mark>calcu</mark>	lated	for each mo	nth			(83)m	n = Sum(74)m	.(82)m					
Solar g (83)m=	ains in 3 34.15		1ated 0.01	for each mo 160.44 196		201.28	191.63	(83)m		. <mark>(82)m</mark> 79.26	_	28.08	3		(83)
(83)m=	34.15	66.8 11	0.01		.62		191.63	`				28.08	3		(83)
(83)m=	34.15	66.8 110	0.01	160.44 196	.62 2)m +		191.63	`	1.6 127.94		42.58	28.08	_		(83) (84)
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(83)m= Total g (84)m= 7. Me	34.15 ains – ir 420.8 an inter erature	66.8 110 nternal and 451.33 483 nal temperal during heat	o.01 solar 2.31 ture (160.44 196 (84)m = (73 513.24 529 (heating sea	.62 2 .81 5 .80n)	(83)m 515.59 area f	191.63 , watts 493.72	164 472	1.6 127.94 .41 445.84	79.26	42.58	I	_	21	(84)
(83)m= Total g (84)m= 7. Me	34.15 ains – ir 420.8 an inter erature	66.8 110 hternal and a 451.33 48.2 hal tempera during heat tor for gains	o.01 solar 2.31 ture (160.44 196 (84)m = (73) 513.24 529 (heating seaderiods in the tiving area, h	.62 2 .81 5 .80n)	(83)m 515.59 area f	191.63 , watts 493.72	472 ole 9	1.6 127.94 .41 445.84	79.26	42.58 6 402.69	I	9	21	(84)
(83)m= Total g (84)m= 7. Me	34.15 ains – ir 420.8 an interesture	66.8 110 nternal and 451.33 483 nal temperal during heat tor for gains Feb N	o.o1 solar 2.31 ture (ing pe	160.44 196 (84)m = (73) 513.24 529 (heating seaderiods in the tiving area, h	62 2 .81 5 .80 5 .81 5 .80 7 .81 7 .81 8 .82 8 .83 8 .83 8 .84 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	(83)m 515.59 area f	191.63 , watts 493.72 From Tab	472 ole 9	.41 445.84 , Th1 (°C)	79.26	6 402.69 Nov	404.8	9	21	(84)
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(93)m= 20.17	20.28	20.45	20.62	20.67	20.68	20.68	20.68	20.68	20.61	20.39	20.16		(93)
8. Space hea													
Set Ti to the i the utilisation					ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	l					7 10.9	Oop					
(94)m= 0.99	0.98	0.95	0.84	0.66	0.45	0.32	0.34	0.57	0.87	0.98	0.99		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 417.09	443.33	458.94	433.27	347.94	232.05	155.78	162.64	252.94	362.41	393.04	402.1		(95)
Monthly average	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	i	i			ì	- `	· · ·	<u> </u>					(0-)
(97)m= 645.83	622.86	562.13	460.86	350.99	232.14	155.78	162.65	253.6	391.95	525.37	637.24		(97)
Space heatin (98)m= 170.18	g require	76.78	r each n 19.87	2.27	Wh/mont	h = 0.02	24 x [(97])m - (95 0)m] x (4 21.98	1)m _{95.27}	174.95		
(98)m= 170.18	120.64	76.78	19.87	2.21	0	0					Ь Н	004.00	7(00)
							rota	l per year	(kvvn/yeai	r) = Sum(9	8)15,912 =	681.96	(98)
Space heatin	g require	ement in	kWh/m²	² /year								10.18	(99)
9b. Energy red	quiremer	nts – Co	mmunity	heating	scheme								
This part is use							.	•		unity sch	neme.		7(204)
Fraction of spa							(Table I	1) 0 11 11	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (301	1) =					[1	(302)
The community so					-				up to four	other heat	sources; th	he latter	
includes boilers, h Fraction of hea					rom power	stations.	See Appel	naix C.				1	(303a)
					oilore				(2	02) x (303	 a\		(304a)
Fraction of total						r commu	unity hea	iting sys		02) X (303	(a) = [1	(305)
Distribution los				,	` ,,		•	0 ,			ا [1.05	(306)
		(Table	120) 101 (Jonninan	ity riodiii	ig dysto					Į		
Space heating Annual space	_	requiren	nent								[kWh/yea 681.96	<u>r</u>
Space heat fro	•	·						(09) v (30)42) v (20)	5) x (306) :	_ [_ [(307a)
Efficiency of se		•		heating	evetam	in % (fro	m Tahle	, , ,	, ,	, , ,	- [716.06	(308
•	,	, , ,	•	_	•	,			01) x 100 ·	,	[[(309)
Space heating		ment no	III SECOII	iuai y/Su¦	эріепіеп	iary sysi	lem	(90) X (30	71) X 100	- (300) =		0	(303)
Water heating Annual water h		eauirem	ent								ſ	1791.08	
If DHW from c	_	•									l		
Water heat fro								(64) x (30	03a) x (30	5) x (306)	= [1880.63	(310a)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	25.97	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0							[0	(314)
Space cooling	(if there	is a fixe	ed cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		[0	(315)
Electricity for p													_
mechanical ve	ntilation	- baland	ced, extra	act or po	sitive in	out from	outside					119.54	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	b) + (330g) =		119.54	(331)
Energy for lighting (calculated in Appendix L)				334.24	(332)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =		3050.47	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		missions g 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	fuel	95	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.22	=	590.4	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	13.48	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	603.88	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			603.88	(376)
CO2 associated with electricity for pumps and fans within dwelling	ing (331)) x	0.52	=	62.04	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	173.47	(379)
Total CO2, kg/year sum of (376)(382) =				839.39	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.53	(384)
El rating (section 14)			Г	89.96	(385)

			User [Details:						
Assessor Name: Software Name:	Stroma FSAP 20)12						Versio	on: 1.0.5.51	
		Р	roperty	Address	Sampl	e 5 (Mid)			
Address :										
1. Overall dwelling dimer	nsions:		A	- (2)		A., Ha	! au la 4 (au a)		\/ = \ = /	2)
Ground floor			Are		(1a) x	Av. ne	3 3	(2a) =	201	<u> </u>
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	1e)+(1r	1)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	heating	heating	· 		7 <u>=</u> F	total	x	40 =		_
•			╛╘		╛╘					╡`
·	0	0	J T L	0] <u> </u>	0			0	╡`
	ns .				Ĺ	2			20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fire	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+	(7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has be	Stroma FSAP 2012 Software Version: Version: 1.0.5.51									
	e dw <mark>elling</mark> (ns)									_
	OF for atool or timbo	r frame or	0.25 to	r maaan	av oonet	ruotion	[(9)	-1]x0.1 =		= '
					•	ruction			0	(11
deducting areas of opening	gs); if equal user 0.35									
•	•	,	.1 (seal	ed), else	enter 0				0	=
•									0	= '
· ·	and doors draught	strippea		0.25 - [0.2	v (14) ± ·	1001 –				=
Infiltration rate				•	, ,	-	+ (15) =			=
	a50, expressed in cu	ubic metre	s per h					area		— (`
•	•		•	•	•					=
· · · · · · · · · · · · · · · · · · ·						is being u	sed			`
Number of sides sheltered	t								3	(19
Shelter factor						19)] =			0.78	=
•	_			(21) = (18) x (20) =				0.27	(21)
		1		Ι.			T		1	
l l		y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind one	eed from Table 7	_				1	1	•	1	
 										
 	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		3.8	3.8	3.7	4	4.3	4.5	4.7		

0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32]	
alculate effec		-	rate for t	he appli	cable ca	se		!			!	<u>.</u>	
If mechanical If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	auation (N	J5)) othe	rwica (23h) = (23a)			0	
If balanced with) = (23a)			0	
		-	-	_					Dls \ /	005) [4 (00-)	0)
a) If balance	a mecn	anicai ve	ntilation	with ne	at recove		1R) (248	$\frac{1}{1} = \frac{2}{2}$	2b)m + (0	23b) × [$\frac{1 - (23c)}{0}$) ÷ 100]]	
	_											J	
b) If balance	o mech	o o	0	without 0	0	overy (i	0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (22)$	0	230)	0	1	
							<u> </u>		0			J	
c) If whole h if (22b)n				•	•				5 x (23h))			
4c)m= 0	0.07	0	0	0	0	0	0	0	0 7 (20)	0	0]	
d) If natural	ventilatio	n or wh	ole hous			ventilatio	<u> </u>					J	
if (22b)n				•	•				0.5]				
4d)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)		•	•	-	
5)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		
Hoot loose	a and he	ot loca i	o comot	or:									
. Heat losse					Net Ar	00	U-valı	110	AXU		k volu	_	ΑXk
LEMENT	Gros area		Openin m		A,r		W/m2		(W/	K)	k-value kJ/m²-		kJ/K
oors					2.4	x	1	= [2.4	Ė.			
/in <mark>dows</mark> Type	1				4.16	x1.	/[1/(1.4)+	0.04] =	5.52	Ħ			
/indows Type	2				4.8	x1.	/[1/(1.4)+	0.04] =	6.36	Ħ			
/alls Type1	29.	4	8.96		20.44	x	0.18	=	3.68	Ħ r		¬ ₹	
/alls Type2	12		2.4		9.6	X	0.18	<u>-</u>	1.73	=		=	
/alls Type3	2.4		0			x				륵 ¦		ᆿ 누	
otal area of e					2.44	=	0.18		0.44	[
or windows and			offective wi	ndow I I-va	43.84		ı formula 1	/[(1/ ₋ valı	د 0.41 (مر	as aiven in	naragrani	h 3 2	
include the area						ateu using	TOTTIUIA T	/[(1/ O -vaic	0-7+0.0 4] 6	is given in	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				20.	13
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	454	.72
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	50
or design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
n be used inste						_							
nermal bridge	•	,		• .	-	<						2.1	19
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =				32
entilation hea		alculator	l monthly	,						[25)m x (5]	١	22.	32
Jan	Feb	Mar	Apr	May	Jun	Jul	Διια	Sep	Oct	Nov	Dec	1	
8)m= 37.12	36.97	36.82	36.11	35.98	35.36	35.36	Aug 35.25	35.6	35.98	36.24	36.52	1	
		<u> </u>			1		1 00.20				1 30.02	J	
eat transfer o		r	F0. / 2	F0.55		F7.55		· · ·	= (37) + (<u> </u>		1	
9)m= 59.44	59.28	59.13	58.43	58.29	57.68	57.68	57.56	57.92	58.29	58.56	58.84	1	

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.89	0.88	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.87	0.88		
Numbe	r of day	rs in mor	nth (Tabl	le 1a\					7	Average =	Sum(40) ₁	12 /12=	0.87	(40)
14411100	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	ter heat	ing ener	gy requi	rement:								kWh/yea	ır:	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		17		(42)
Reduce	the annua	ıl average		usage by	5% if the d	welling is	designed t	(25 x N) to achieve		se target o		.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres per	day for ea	ach month	Vd,m = fac	ctor from	Table 1c x	(43)			,			
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		—
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4.$	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1029.18	(44)
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
										Γotal = Su	m(45) ₁₁₂ =		1349.41	(45)
							_	boxes (46)						(10)
(46)m= Water	20.99 storage	18.35 loss:	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	_		includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If comr	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is knov	wn (kWł	n/dav):				1	39		(48)
•			m Table			`	, , ,					54		(49)
-			storage		ear			(48) x (49)) =			75		(50)
,			eclared o	•										(- 1)
		•	factor fr ee section		e z (KVVI	i/iitie/ua	iy)					0		(51)
	-	from Tal										0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
٠.			storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	-	0		(54)
	` ' '	54) in (5	culated f	or oach	month			((56)m = (EE) ~ (41);	~	0.	75		(55)
i	23.33	21.07	23.33	22.58	23.33	22.58	23.33			23.33	22.58	23.33		(56)
(<mark>56)</mark> m= If cylinde								23.33 0), else (5	22.58 7)m = (56)			m Appendix	Н	(30)
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
` ′			nual) fro									0		(58)
		•	•			59)m = ((58) ÷ 36	65 × (41)	m			~		(30)
	•				•	•	. ,	ng and a		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	i loss ca	lculated	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 h	neat req	uired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		(62)
Solar DI	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	•	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
		-		-		-	-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	ude (57)	m in cald	culation o	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. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	s (Table	5), Wat	ts									_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	<mark>ig g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	18.37	16.32	13.27	10.05	7.51	6.34	6.85	8.91	11.95	15.18	17.72	18.89		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	s and fa	ns gains	(Table 5	 5a)		-	-	-		-	-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	/aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)				=	=		=	-			
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65		(72)
Total i	internal	gains =	:			(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	379.77	377.7	365.57	346.16	326.63	307.78	295.56	301.21	311.21	330.81	353.25	369.91		(73)
6. So	lar gains	s:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat		ion.		
Orient		Access F		Area		Flu		-	g_ 	_	FF		Gains	
	ļ	Table 6d		m²			ole 6a	. <u> </u>	able 6b		able 6c	<u></u>	(W)	_
East	0.9x	0.77	X	4.1	6	x 1	9.64	X	0.63	x	0.7	=	24.97	(76)
East	0.9x	0.77	х	4.8	3	x 1	9.64	x	0.63	x	0.7	=	28.81	(76)
East	0.9x	0.77	х	4.1	6	x 3	88.42	X	0.63	x	0.7	=	48.85	(76)
East	0.9x	0.77	X	4.8	3	x 3	88.42	X	0.63	X	0.7	=	56.36	(76)

East 0.9						_						
	0.77	X	4.16	x	63.27	X	0.63	X	0.7	=	80.44	(76)
East 0.9	0.77	X	4.8	X	63.27	X	0.63	X	0.7	=	92.82	(76)
East 0.9	0.77	X	4.16	X	92.28	X	0.63	X	0.7	=	117.32	(76)
East 0.9	0.77	X	4.8	X	92.28	X	0.63	X	0.7	=	135.37	(76)
East 0.9	0.77	X	4.16	x	113.09	X	0.63	x	0.7	=	143.78	(76)
East 0.9	0.77	X	4.8	x	113.09	X	0.63	x	0.7	=	165.9	(76)
East 0.9	0.77	X	4.16	x	115.77	X	0.63	x	0.7	=	147.18	(76)
East 0.9	0.77	X	4.8	X	115.77	X	0.63	x	0.7	=	169.83	(76)
East 0.9	0.77	X	4.16	x	110.22	X	0.63	X	0.7	=	140.13	(76)
East 0.9	0.77	x	4.8	x	110.22	X	0.63	x	0.7	=	161.68	(76)
East 0.9	0.77	X	4.16	x	94.68	X	0.63	x	0.7	=	120.37	(76)
East 0.9	0.77	X	4.8	x	94.68	X	0.63	x	0.7	=	138.88	(76)
East 0.9	0.77	x	4.16	x	73.59	X	0.63	x	0.7	=	93.56	(76)
East 0.9	0.77	x	4.8	×	73.59	X	0.63	x	0.7	_ =	107.95	(76)
East 0.9	0.77	x	4.16	×	45.59	X	0.63	x	0.7	=	57.96	(76)
East 0.9	0.77	x	4.8	X	45.59	X	0.63	×	0.7	=	66.88	(76)
East 0.9	0.77	x	4.16	×	24.49	X	0.63	x	0.7	=	31.13	(76)
East 0.9	0.77	x	4.8	X	24.49	X	0.63	Х	0.7		35.92	(76)
East 0.9	0.77	×	4.16	= x	16.15	X	0.63	x	0.7	=	20.53	(76)
East 0.9	0.77	X	4.8	x	16.15	jx	0.63	x	0.7	=	23.69	(76)
						/						
Solar gains	in watts, cal	culated	for each mo	nth		(83)m	n = Sum(74)m.	(82)m				
Solar gains (83)m= 53.7		culated 173.26	252.69 309.		17.01 301.81	(83)m 259		(82)m 124.8	4 67.06	44.23		(83)
(83)m= 53.7	8 105.21	173.26		68 3		ì		• •	4 67.06	44.23		(83)
(83)m= 53.7	8 105.21 – internal an	173.26	252.69 309.	68 3 m + (ì	.25 201.51	• •		44.23]	(83) (84)
(83)m= 53.7 Total gains (84)m= 433.	8 105.21 - internal an	173.26 d solar 538.83	252.69 309. (84)m = (73)	68 3 m + (83)m , watts	259	.25 201.51	124.8		<u> </u>]	` ,
(83)m= 53.7 Total gains (84)m= 433.	8 105.21 - internal and 55 482.91 ternal tempe	173.26 d solar 538.83 rature	252.69 309. (84)m = (73) 598.85 636. (heating seas	68 3 m + (31 6	83)m , watts	259 560	.25 201.51	124.8		<u> </u>	21	` ,
(83)m= 53.7 Total gains (84)m= 433.9 7. Mean in	8 105.21 - internal and 55 482.91 ternal temperare during he	d solar 538.83 rature (252.69 309. (84)m = (73) 598.85 636. (heating seaseriods in the	68 3 m + (31 6 son)	83)m , watts 524.8 597.37	259 560	.25 201.51	124.8		<u> </u>	21	(84)
(83)m= 53.7 Total gains (84)m= 433.9 7. Mean in	8 105.21 - internal and 55 482.91 ternal temperare during hereactor for gain	d solar 538.83 rature (252.69 309. (84)m = (73) 598.85 636. (heating seaseriods in the	68 3 m + (31 6 son) living	83)m , watts 524.8	560 ble 9	.25 201.51	124.8	4 420.3	<u> </u>	21	(84)
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(83)m = 53.7 Total gains (84)m = 433.3 7. Mean in Temperatu Utilisation (86)m = 1 Mean inter (87)m = 20.1 Temperatu (88)m = 20.1 Utilisation (89)m = 1 Mean inter (90)m = 19.0	8 105.21 - internal and 155 482.91 ternal temperary 10.99 nal temperary 10.99 nal temperary 10.99 factor for gain 10.99 nal temperary 10.99 nal temperary 19.26	d solar 538.83 rature ating pons for li 0.98 ture in li 20.51 ating pons for r 0.97 ture in til 19.57	252.69 309. (84)m = (73) 598.85 636. (heating seaseriods in the eving area, had a considered from the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the	68 3 m + (31 6 son) living l,m (seay) 9 (follo 9 of dw 9 ug, h2 4 relling 4	area from Ta ee Table 9a) Jun Jul 0.58 0.42 w steps 3 to 20.99 21 velling from Ta 20.2 20.2 m (see Table 0.51 0.35 T2 (follow steps)	259 560 ble 9 0.4 7 in T 2 able 9 0.3 eps 3	25 201.51 .46 512.71 , Th1 (°C) ug Sep 17 0.74 Table 9c) 1 20.97 9, Th2 (°C) 2 20.2 9 0.67 1 to 7 in Table 2 20.17	124.8- 455.6- Oct 0.95 20.75 20.19 0.93 e 9c) 19.9	Nov 0.99 20.41 20.19 0.99	Dec 1 20.15 20.19 1		(84) (85) (86) (87) (88) (89)
(83)m = 53.7 Total gains (84)m = 433. 7. Mean in Temperatu Utilisation (86)m = 1 Mean inter (87)m = 20.1 Temperatu (88)m = 20.1 Utilisation (89)m = 1 Mean inter (90)m = 19.0 Mean inter (90)m = 19.0	a los.21 - internal and loss 482.91 ternal temperator for gain Feb 0.99 nal temperator for gain Reduring here during here and loss 20.18 factor for gain Reduring here and loss 20.18 factor for gain Re	d solar salar 252.69 309. (84)m = (73) 598.85 636. (heating seaseriods in the eving area, have been dependent on the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of	68 3 m + (31 6 son) living l,m (say 9 (follo 9 4 2 of dw 9 velling 4 welling	83)m , watts 524.8 597.37 area from Ta ee Table 9a) Jun Jul 0.58 0.42 w steps 3 to 20.99 21 velling from Ta 20.2 20.2 m (see Table 0.51 0.35 T2 (follow steps)	259 560 ble 9 0.4 7 in T 2 able 9 0.3 eps 3 20 + (1 20.	25 201.51 .46 512.71 .46 512.71 .47 (°C) .48 Sep .49 0.74 .40 20.97 .40 20.97 .40 20.97 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 10 .40 7 .40 7 10 .40 7 10 .40 7 10 .40 7	124.8- 455.6- Oct 0.95 20.75 20.19 0.93 e 9c) 19.9 LA = Liv	Nov 0.99 20.41 20.19 0.99 19.43 ving area ÷ (-	Dec 1 20.15 20.19 1		(84) (85) (86) (87) (88) (89)	

(93)m= 19.5	19.69	19.96	20.28	20.46	20.52	20.53	20.53	20.5	20.25	19.83	19.5		(93)
8. Space h	neating req	uirement											
	ne mean in				ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	ion factor fo				1	11	A	0	0-4	Nien	Dan		
Ja	n Feb factor for g	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m = 0.9		0.97	0.9	0.75	0.54	0.38	0.42	0.69	0.94	0.99	1		(94)
` '	ns, hmGm		<u> </u>		0.04	0.00	0.42	0.00	0.04	0.00	<u>'</u>		()
(95)m= 431.		522.62	541.28	479.47	338.28	226.29	237.09	356.27	426.58	415.27	412.42		(95)
` '	/erage exte		ı perature	from Ta	L able 8	<u> </u>							
(96)m= 4.3		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	rate for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			l	
(97)m= 90	876.57	795.67	664.72	510.92	341.61	226.58	237.66	370.66	562.54	745.78	900.25		(97)
Space hea	ating requir	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m= 352	.5 268.14	203.15	88.88	23.4	0	0	0	0	101.15	237.97	362.95		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1638.13	(98)
Space hea	ating require	ement in	kWh/m²	/year								24.45	(99)
9a. Energy	requiremen	nts – Indi	ividual h	eating sy	vstems i	ncluding	ı micro-C	CHP)					
Space he	·				, 0.0			, , , , , , , , , , , , , , , , , , ,					
•	f space hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction o	f space hea	at from m	nain syst	em(s)			(20 <mark>2</mark>) = 1 -	(201) =				1	(202)
	f total heati						(204) = (2	02) × [1 –	(203)] =			1	(204)
	of main spa											93.5	(206)
-	of seconda				a evetom	0/-						0	(208)
		, ,,											┛` ′
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space nea	ating require .5 268.14	- `	88.88	23.4	0	0	0	0	101.15	237.97	362.95		
	<u> </u>		<u> </u>		0	0	0		101.13	231.91	302.93		
$(211)m = \{[$	` í ` `	1	95.06	25.03					108.18	254.51	388.18		(211)
37	200.76	217.27	95.06	25.03	0	0	0 Tota	0 II (kWh/yea				4750.04	(211)
0	de Calla		\ 1\A/L./				Tota	ii (KVVII/yCc	ar) =0arri(2	- 1 1/15,1012	_	1752.01	(211)
Space nea = {[(98)m x	ating fuel (s		• •	montn									
$= ((30) \text{III} \times (215) \text{m} = 0$		00 + (20	0	0	0	0	0	0	0	0	0		
(= : -)								l (kWh/yea				0	(215)
Water heat	ina							, ,		7 10,1012		<u> </u>	` ′
Output from	_	iter (calc	ulated al	bove)									
186		172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		
Efficiency c	f water hea	ater	•				•				•	79.8	(216)
(217)m= 86.4	19 86.11	85.25	83.39	81.08	79.8	79.8	79.8	79.8	83.62	85.71	86.62		(217)
Fuel for wa	ter heating,	, kWh/mo	onth				•					•	
(219)m = (:					15-			Ī	
(219)m= 215.	64 190.97	202.78	186.08	187.75	170.73	164.23	179.84	179.41	192.42	198.17	210.21		٦.
							lota	II = Sum(2 ⁻				2278.25	(219)
Annual tot Space heat		niem he	svetem	1					k\	Wh/year	•	kWh/yeai 1752.01	기
opace near	ing luci ust	ou, main	System	•								1732.01	

Water heating fuel used				2278.25	1
Electricity for pumps, fans and electric keep-hot					J
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45	j	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				324.5	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4429.75	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	378.43	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	492.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			870.54	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	168.41	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		16.09	(272)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height: 55.1 m² Floor 0 3 m

26 m² (fraction 0.472) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
DOOR	<u>Manufacturer</u>	Solid			Wood
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
Ralcony	Manufacturer	Windows	low_F En $= 0.05$ soft coat	. No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	4.16	1
Б. 1		0.7	0.4		4.0	

Balcony 0.7 0.4 1 4.8 1 Width: Type-Name: Location: Height: Name: Orient:

DOOR INT Worst case 0 W W West 0 0 Balcony W West 0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
W	24	8.96	15.04	0.15	0	False	N/A
INT	24	2.4	21.6	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Internal Flomen	te						

<u>Internal Elements</u> Party Elements

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Yes (As designed) Pressure test:

SAP Input

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

		_ l loon	Dotoile: -						
		User	Details:		_				
Assessor Name:			Strom				., .	40554	
Software Name: S	troma FSAP 2012	Duanant	Softwa				Version	on: 1.0.5.51	
Address		Property	Address:	Sample	e 6 (IVIId)				
Address: 1. Overall dwelling dimension	nns:								
1. Overall awelling aimener	лю.	Are	ea(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor				(1a) x		3	(2a) =	165.3	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+	(1n)	55.1	(4)			J		
Dwelling volume		` ′	00.1		o)+(3c)+(3c	d)+(3e)+	.(3n) =	165.3	(5)
				(33) (33	, (33)	., (==)		100.3	
2. Ventilation rate:	main seco		other		total			m³ per hou	ır
Number of chimneys	heating heati		0	л ₌ г	0	x 4	40 =	0	(6a)
•		<u></u>]			20 =		╡` ′
Number of open flues	0 + (·	0] - [0			0	(6b)
Number of intermittent fans					0	x ′	10 =	0	(7a)
Number of passive vents					0	X '	10 =	0	(7b)
Number of flueless gas fires					0	X 4	40 =	0	(7c)
							A in ak	angos nor h	011F
				_				nanges per he	_
Infiltration due to chimneys, f				antinuo fi	0		÷ (5) =	0	(8)
Number of storeys in the d		oceed to (17)	, otrierwise t	oriunde ii	10111 (9) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timber fram	e or 0.35 f	or masonr	y const	ruction			0	(11)
if both types of wall are preser		ing to the gre	ater wall are	a (after					
deducting areas of openings); If suspended wooden floor		or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, enter (,	o. o (ooa	,,					0	(13)
Percentage of windows an		ed						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
Air permeability value, q50	•	-	•	•	etre of e	envelope	area	3	(17)
If based on air permeability v								0.15	(18)
Air permeability value applies if a Number of sides sheltered	pressurisation test has bee	n done or a d	egree air pe	rmeability	is being u	sed			(40)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.78	(19) (20)
Infiltration rate incorporating	shelter factor		(21) = (18)) x (20) =				0.12	(21)
Infiltration rate modified for m								02	` ′
Jan Feb Mai	r Apr May J	un Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind speed	from Table 7	•	•			•	•	_	
$ (22)m = \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4.4 4.3 3	.8 3.8	3.7	4	4.3	4.5	4.7]	
			•		•	•	•	-	
Wind Factor (22a)m = (22)m $(22a)^{-1}$		05 0.05	0.00		1 4 00			1	
(22a)m= 1.27 1.25 1.23	1.1 1.08 0.	95 0.95	0.92	1	1.08	1.12	1.18	J	

0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14]	
alculate effe		-	rate for t	he appli	cable ca	se	•	•	•	•	•	<i>.</i>	
If mechanica			andiv NL (O	12h) (22	s) Fm; //	aguatian (I	VEVV otho	muiaa (22h	\ (225\			0.5	(2:
If exhaust air he		0 11		, ,	,	. `	,, .	,) = (23a)			0.5	(23
If balanced with		-	-	_					51.) (001) [4 (00.)	79.05	(2:
a) If balance						- ` ` 	- ´ ` -	ŕ	 		- ` ´	i ÷ 100] 1	(24
1a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	J	(2
b) If balance				ı —			- ^ ` ` 	í `	 		Ι ,	1	(2
1b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(2
c) If whole h if (22b)n					•				5 v (22h	.)			
1 (220)11 1c)m= 0	0.5 x	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0 × (230	0	0	1	(2
-/									U	0		J	(2
d) If natural if (22b)n				•	•				0.5]				
1d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	· (25)		<u>I</u>		1	
5)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	1	(2
						I							
. Heat losse													
LEMENT	Gros area		Openin		Net Ar A ,r		U-valı W/m2		A X U (W/I	()	k-value kJ/m²-l		A X k kJ/K
oors	a. oa	()			2.4	x	1.4	= [3.36	·,	,,,,,		(2
in <mark>dows</mark> Type	1				4.16	=	1/[1/(1)+		4	Ħ			(2
indows Type							1/[1/(1)+	L L		Ħ			(2
				\	4.8				4.62	븍 ,			<u> </u>
alls Type1	24		8.96		15.04	=	0.15	=	2.26	닠 ¦		╛╠	(2
alls Type2	24		2.4	_	21.6	X	0.15	=	3.23	닠 !		⊣	(2
alls Type3	2.4		0		2.4	X	0.35	=	0.84				(2
otal area of e	lements	, m²			50.4								(3
or windows and include the area						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	1 3.2	
abric heat los				is and par	uuons		(26)(30)) + (32) =				18.3	(3
eat capacity		,	0)				(-) ()		.(30) + (32	2) + (32a)	(32e) =		(3
ear capacity nermal mass		. ,	2 – Cm =	_ ΤΕΔ\ ir	n k I/m²K				tive Value:	, , ,	(020) =	546.56	(3
r design assess	•	,		,			ecisely the				ahle 1f	250	(
n be used inste				CONSTRUCT	ion are no	i kilowii pi	colsoly the	maidanvo	values of	11011 111 10	ubic 11		
nermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	K						7.56	(3
letails of therma		are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he	at loss							(33) +	(36) =			25.86	(3
entilation hea	t loss ca	alculated	monthly	У				(38)m	= 0.33 × (25)m x (5))	1	
1	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan													
Jan 13.8	13.64	13.48	12.69	12.53	11.74	11.74	11.58	12.06	12.53	12.85	13.17]	(3
			12.69	12.53	11.74	11.74	11.58	<u> </u>	12.53 = (37) + (3	<u> </u>	13.17]	(3

eat ic	ss para	meter (F	ILP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m=	0.72	0.72	0.71	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.7	0.71		
umba	r of dov	a in mar	oth /Tab	lo 1o\					1	Average =	Sum(40) ₁ .	12 /12=	0.7	(4
umbe	Jan	Feb	nth (Tab Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	Apr 30	31	30	31	31	30 30	31	30	31		(4
. ,–			01	- 00	0.		<u> </u>			<u> </u>		<u> </u>		(-
1 Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ar.	
				romont.										
if TF.				[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (ΓFA -13.		84		(4
educe	the annua	l average	hot water	usage by	5% if the a	lwelling is	designed t	(25 x N) to achieve		se target o		.91		(4
t more I				day (all w						1				
ot wate	Jan	Feb	Mar	Apr ach month	May	Jun	Jul Table 10 X	Aug	Sep	Oct	Nov	Dec		
4)m=	85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7	024.00	<u> </u>
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		934.88	(4
5)m=	127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
									-	L Total = Su	m(45) ₁₁₂ =		1225.78	(4
nstant	aneous w	ater he <mark>ati</mark> i	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)			,		
6)m=	19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(4
	storage		, , ,,			1144 IDO								
								within sa	ame ves	sei		0		(4
	-	_		nk in dw	_			(47) mbi boil	ore) onto	or 'Ω' in <i>(</i>	47)			
	storage		not wate	i (uno m	iciuues i	nstantai	16003 00	ilibi boli	craj crite	51 0 111 (71)			
	_		eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(-
mpe	rature fa	actor fro	m Table	2b								0		(4
ergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(!
				ylinder l										
		•		om Tabl	e 2 (kWl	h/litre/da	ıy)				0.	02		(
	-	eating s from Tal	ee sectio	on 4.3								00		,
			m Table	2b							-	.6		()
•				, kWh/ye	ar			(47) x (51)) x (52) x (53) =		03		(
٠,		54) in (5	•	, 10011/90	Zai			(11) X (01)	/ X (OL) X (00) –		03		(+
	. , .	, ,	•	or each	month			((56)m = (55) × (41)ı	m				·
s)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
												m Appendi	ix H	(
')m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
,						1 00.00		02.01			<u> </u>			·
	v circuit	loss (an	nual) fro	ım Tahle	3.						1	0 I		(5
		•	•			E0\~ '	(EO) . OC	E /44\	m					`
mar	y circuit	loss cal	culated f	for each	month (•	. ,	65 × (41) ng and a		r thermo				`

Comb	i loss ca	lculated	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 I	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.36	161.08	169.97	153.49	151.23	136.29	132	143.32		159.11	166.83	178.35		(62)
Solar D	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	16.59	14.71	15.14	13.33	12.81	11.05	10.22	11.77	11.91	13.81	14.97	16.12	•	(63) (G2)
Outpu	t from w	ater hea	ter											
(64)m=	163.1	143.95	152.16	137.57	135.73	122.64	119.09	128.87	7 128.08	142.61	149.26	159.55		
		•				•		Ot	utput from wa	ater heate	r (annual)₁	12	1682.61	(64)
Heat o	gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	86.48	76.9	82.36	76.04	76.12	70.32	69.73	73.5	72.42	78.74	80.48	85.14		(65)
inclu	ude (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	ıs (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>tir</mark>	ng gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.29	13.58	11.05	8.36	6.25	5.28	5.7	7.41	9.95	12.63	14.74	15.72		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			•	
(68)m=	160.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooki	ng gains	(calcula	ited in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5			'	
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pump:	s and fa	ns gains	(Table 5	Ба)					•	!			ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (negat	ive valu	es) (Tab	le 5)			•	•	•		1	
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	[(71)
Water	heating	gains (T	able 5)						•				ı	
(72)m=	116.23	114.43	110.7	105.62	102.32	97.67	93.73	98.78	100.58	105.84	111.78	114.44		(72)
Total	internal	gains =				(66)	m + (67)m	+ (68)n	n + (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m=	342.57	340.73	330.26	313.56	296.88	280.66	270.06	275.17	7 283.69	300.57	319.89	334.13		(73)
6. So	lar gains	S:												
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu			_ g	_	FF		Gains	
		Table 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
West	0.9x	0.77	X	4.1	6	x 1	9.64	х	0.4	X	0.7	=	15.85	(80)
West	0.9x	0.77	X	4.8	8	x 1	9.64	х	0.4	x	0.7	=	18.29	(80)
West	0.9x	0.77	X	4.1	6	x 3	8.42	x	0.4	x	0.7	=	31.01	(80)
West	0.9x	0.77	X	4.8	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(80)

	_		_					_						
West	0.9x	0.77	X	4.16	Х	6	3.27	X	0.4	x	0.7	=	51.07	(80)
West	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	x	0.7	=	58.93	(80)
West	0.9x	0.77	X	4.16	X	9	2.28	X	0.4	X	0.7	=	74.49	(80)
West	0.9x	0.77	X	4.8	X	9	2.28	X	0.4	x	0.7	=	85.95	(80)
West	0.9x	0.77	X	4.16	X	1	13.09	x	0.4	X	0.7	=	91.29	(80)
West	0.9x	0.77	X	4.8	X	1	13.09	x	0.4	X	0.7	=	105.33	(80)
West	0.9x	0.77	x	4.16	x	1	15.77	x	0.4	X	0.7	=	93.45	(80)
West	0.9x	0.77	x	4.8	x	1	15.77	X	0.4	x	0.7	=	107.83	(80)
West	0.9x	0.77	x	4.16	X	1	10.22	x	0.4	x	0.7	=	88.97	(80)
West	0.9x	0.77	x	4.8	x	1	10.22	x	0.4	X	0.7	=	102.66	(80)
West	0.9x	0.77	x	4.16	x	9	4.68	X	0.4	x	0.7	=	76.42	(80)
West	0.9x	0.77	x	4.8	X	9	4.68	x	0.4	x	0.7	=	88.18	(80)
West	0.9x	0.77	x	4.16	X	7	3.59	x	0.4	x	0.7	=	59.4	(80)
West	0.9x	0.77	x	4.8	x	7	3.59	X	0.4	x	0.7	=	68.54	(80)
West	0.9x	0.77	X	4.16	x	4	5.59	X	0.4	X	0.7	=	36.8	(80)
West	0.9x	0.77	x	4.8	X	4	5.59	x	0.4	x	0.7	=	42.46	(80)
West	0.9x	0.77	X	4.16	X	2	4.49	X	0.4	X	0.7	=	19.77	(80)
West	0.9x	0.77	x	4.8	X	2	4.49	Х	0.4	X	0.7	=	22.81	(80)
West	0.9x	0.77	x	4.16	x	1	6.15	x	0.4	X	0.7		13.04	(80)
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	Х	0.7		15.04	(80)
								7						
		wotto colou	otod	for each m	onth			(83)m	n = Sum(74)m	(82)m				
Solar g	ains in	walls, calcu	aleu	TOT GACITITI	OHUI			(00)11	1 – Sum(74)11	.(02)111			_	
Solar g (83)m=	34.15).01			201.28	191.63	164		79.26		28.08		(83)
(83)m=	34.15		0.01	160.44 19	6.62			`			_	28.08		(83)
(83)m=	34.15	66.8 110	0.01	160.44 19 (84)m = (73	6.62 3)m +			`	1.6 127.94		42.58	28.08 362.21]	(83) (84)
(83)m= Total g	3 <mark>4.15</mark> ains – ir 376.72	66.8 110	0.01 solar 0.27	160.44 19 (84)m = (73 474 49	3)m +	(83)m	, watts	164	1.6 127.94	79.26	42.58]	` ,
(83)m= Total g (84)m= 7. Mea	3 <mark>4.15 ains — ir 376.72 an inter</mark>	66.8 111 nternal and 407.53 44	0.01 solar 0.27 ture (160.44 19 (84)m = (73) 474 49 (heating sea	3)m + 93.5 ason)	(83)m 481.94	, watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58		21	` ,
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter	66.8 110 nternal and 3 407.53 440 nal tempera	o.01 solar o.27 ture (160.44 19 (84)m = (73 474 49 (heating seconds in the	6,62 3)m + 93.5 ason)	(83)m 481.94 area f	watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58		21	(84)
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter	66.8 111 Atternal and a 407.53 444 nal tempera during heat tor for gains	o.01 solar o.27 ture (160.44 19 (84)m = (73) 474 49 heating seareriods in the ving area, I	6,62 3)m + 93.5 ason)	(83)m 481.94 area f	watts 461.69	439 ble 9	1.6 127.94 .77 411.64	79.26	3 362.47		21	(84)
Total g (84)m= 7. Mea	34.15 ains – ir 376.72 an inter erature tion fac	66.8 111 Aternal and a 407.53 444 nal tempera during heat tor for gains Feb N	o.01 solar o.27 ture (ng po	160.44 19 (84)m = (73 474 49 (heating seareriods in the ving area, I	6.62 3)m + 93.5 ason) e living h1,m ((83)m 481.94 I area f	watts 461.69 from Tab ble 9a)	439 ble 9	.77 411.64 , Th1 (°C)	79.26	3 362.47	362.21	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – in 376.72 an inter erature tion fac Jan 0.99	66.8 111 Aternal and a 407.53 444 nal tempera during heat tor for gains Feb N	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (73 474 49 (heating seconds in the ving area, I Apr N 0.88 0	ason) e living h1,m ((83)m 481.94 1 area 1 see Ta Jun 0.5	from Table 9a) Jul 0.36	164 439 ole 9 A	.77 411.64 .Th1 (°C) ug Sep	79.26 379.8	3 362.47 Nov	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – in 376.72 an inter erature tion fac Jan 0.99	hternal and additional temperal during heat tor for gains Feb M 0.99 0.1 temperatur	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (73 474 49 (heating seconds in the ving area, I Apr N 0.88 0	ason) e living h1,m ((83)m 481.94 1 area 1 see Ta Jun 0.5	from Table 9a) Jul 0.36	164 439 ole 9 A	.77 411.64 .Th1 (°C) ug Sep 0.63 Table 9c)	79.26 379.8	3 362.47 t Nov 0.98	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 376.72 an interestature tion fact Jan 0.99 interna 20.47	66.8 111 Aternal and 407.53 444 Mal temperal during heat tor for gains Feb M 0.99 0.1 temperatur 20.57 20	o.01 solar o.27 ture (ong pofor life) for life e in l o.73	160.44 19 (84)m = (73 474 49 (heating seconds in the ving area, I Apr N 0.88 0 iving area 7 20.91 20	ason) e living h1,m (May .71 T1 (foll	(83)m 481.94 1 area 1 see Ta Jun 0.5 ow ste	watts 461.69 from Table 9a) Jul 0.36 ps 3 to 7	439 ole 9 A 0.3 7 in T	.77 411.64 .77 411.64 .Th1 (°C) ug Sep 0.63 .Table 9c)	79.26 379.8 Oct 0.91	3 362.47 t Nov 0.98	362.21 Dec 0.99	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 376.72 an interestature tion fact Jan 0.99 interna 20.47	hternal and a 407.53 444 hal temperal during heat tor for gains Feb M 0.99 0.1 temperatur 20.57 20 during heat	o.01 solar o.27 ture (ong pofor life) for life e in l o.73	160.44 19 (84)m = (73 474 49 (heating searods in the ving area, I Apr	ason) e living h1,m (May .71 T1 (foll	(83)m 481.94 1 area 1 see Ta Jun 0.5 ow ste	watts 461.69 from Table 9a) Jul 0.36 ps 3 to 7	439 ole 9 A 0.3 7 in T	.77 411.64 .77 411.64 .78 Sep .89 0.63 .79 Sep .90 0.63 .70 Sep .70 0.63 .70 Sep .70 0.63	79.26 379.8 Oct 0.91	3 362.47 t Nov 0.98	362.21 Dec 0.99	21	(84)
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0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .7	79.26 379.8 Oct 0.91 20.9 20.3 ² 0.88 e 9c) 20.23 A = Li	3 362.47 Nov 0.98 20.66 20.34 0.98 19.91 ving area ÷ (-	Dec 0.99 20.45 20.33 0.99 19.6 4) =		(84) (85) (86) (87) (88) (89) (90) (91)
(83)m = Total g (84)m = 7. Mean (86)m = Mean (87)m = Temp (88)m = Utilisa (89)m = Mean (90)m = Mean (92)m =	an interrection factors of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the	1 temperatur 19.76 19	0.01	160.44 19 (84)m = (73 474 45 45 45 45 45 45 4	ason) e living h1,m (May .71 T1 (foll 0.98 st of d 0.34 ling, h2 .66 dwelling 0.33	(83)m 481.94 1 area f see Ta Jun 0.5 ow ste 21 welling 20.36 2,m (se 0.45 20.36 ng) = fl 20.66	watts 461.69 from Table 9a) Jul 0.36 ps 3 to 7 21 from Ta 20.36 ee Table 0.31 collow ste 20.36 A × T1 20.66	164 439 ble 9 0.3 7 in T 2 9a) 0.3 20. + (1 20.	.77 411.64 .77 411.64 .77 411.64 .78 Sep .99 0.63 .79 0.63 .79 0.63 .79 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .7	79.26 379.8 Oct 0.91 20.9 20.34 0.88 9 9c) 20.23 A = Li	3 362.47 1 Nov 0.98 20.66 4 20.34 0.98 3 19.91 ving area ÷ (Dec 0.99 20.45 20.33 0.99		(84) (85) (86) (87) (88) (89)

	7 (00)
(93)m= 20.02 20.14 20.34 20.55 20.64 20.66 20.66 20.66 20.65 20.55 20.26 20	(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-ca	lculate
the utilisation factor for gains using Table 9a	Culate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	_
(94)m= 0.99 0.98 0.95 0.86 0.68 0.47 0.33 0.36 0.6 0.89 0.98 0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m	_
(95)m= 373.14 400.08 419.69 407.11 336.37 227.49 152.65 159.53 246.46 336.79 354.14 359.47	(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)m x [(93)m– (96)m]	7 (07)
(97)m= 623.38 602.1 544.52 449.25 343.17 227.85 152.67 159.56 248.48 381.89 509.64 616.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m=	٦
Total per year (kWh/year) = Sum(98) _{159,.12} :	
Space heating requirement in kWh/m²/year	14.29 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community scheme.	0 (301)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	
Fraction of space heat from community system 1 – (301) =	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources,	the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers	1 (303a)
Fraction of total space heat from Community boilers (302) x (303a) =	1 (304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	787.15
Space heat from Community boilers (98) x (304a) x (305) x (306) =	826.51 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (309)
Water heating	
Annual water heating requirement	1682.61
If DHW from community scheme:	(040-)
Water heat from Community boilers $(64) \times (303a) \times (305) \times (306) =$	1766.74 (310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] =$	25.93 (313)
Cooling System Energy Efficiency Ratio	0 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0 (315)
Electricity for pumps and fans within dwelling (Table 4f):	
mechanical ventilation - balanced, extract or positive input from outside	98.31 (330a)
	<u> </u>

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330l	o) + (330g) =		98.31	(331)
Energy for lighting (calculated in Appendix L)				270.05	(332)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =		2961.62	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factoring the kg CO2/kWh		nissions J 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	d fuel	95	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.22	=	589.62	(367)
Electrical energy for heat distribution	((313) x	0.52	=	13.46	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	603.08	(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	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			603.08	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	=	51.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	140.16	(379)
Total CO2, kg/year sum of (376)(382) =				794.26	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.41	(384)
El rating (section 14)				89.37	(385)

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	: Sampl	e 6 (Mid)			
Address :										
1. Overall dwelling dime	nsions:			(0)						•
Ground floor				a(m²) 55.1	(1a) x	Av. He	gight(m)	(2a) =	Volume(m) 165.3	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1)	55.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:										
Number of chimneys		secondar heating 0	y □ + □	other 0	7 ₌ [total 0	x	40 =	m³ per hou	ır ─── _{(6a}
Number of open flues	0 +	0	┧╻┝	0]		x	20 =	0	(6b
Number of intermittent far		0	J	0		0		10 =		╡`
	1S				Ļ	2			20	(7a)
Number of passive vents					Ĺ	0		10 =	0	(7b
Number of flueless gas fir	res					0	X ·	40 =	0	(7c
								Δir ch	nanges per h	our
Infiltration due to chimney	(c. fluor and fans – (6a)+(6b)+(7	′a)±(7h)±((7c) -	Г		_			_
If a pressurisation test has be					continue f	20 rom (9) to		÷ (5) =	0.12	(8)
Number of storeys in th							-/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.					-	ruction			0	(11
if both types of wall are pr deducting areas of openin		sponding to	the grea	ter wall are	a (after					
If suspended wooden f		aled) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught s	stripped							0	(14
Window infiltration				0.25 - [0.2	,	-			0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value,	•		•	•	•	netre of e	envelope	area	5	(17
If based on air permeabili Air permeability value applies	-					ris heina u	beau		0.37	(18
Number of sides sheltere		as been dor	ie or a de	gree an pe	тнеаышу	is being u	360		3	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.78	(20
Infiltration rate incorporati	ing shelter factor			(21) = (18) x (20) =				0.29	(21
Infiltration rate modified for	or monthly wind spee	ed								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Mind Factor (00.) (25)\								-	
Wind Factor (22a)m = $(22a)$ m =	′ 	0.05	0.05	0.00	4	1 4 00	1 4 40	1 4 40	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.37	0.36	0.35	0.32	0.31	d wind s	0.27	0.27	0.29	0.31	0.32	0.34		
Calculate effec		•	rate for t	he appli	cable ca	se	ļ	ļ		<u> </u>	!]	
If mechanica			anadin NL (O	ah) (00-	· \		\ 		\ (00-)			0	
If exhaust air he) = (23a)			0	
If balanced with		-	-	_					SI. \	001) [4 (00.)	0	(2
a) If balance	a mecn	anicai ve	entilation 0	with ne	at recove	ery (MV)	$\frac{1R}{0}$	$\frac{1}{1} = \frac{22}{1}$	2b)m + (0	$\frac{230) \times [}{0}$	1 – (23c)	i ÷ 100] I	(2
b) If balance			l								0		(4
24b)m= 0	o mech	o 0	o nulation	without 0	neat rec	overy (i	0	0	0	0	0	1	(2
c) If whole h												J	(-
if (22b)n				•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft				,	
if (22b)n	n = 1, th	en (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		,	•	
4d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(2
Effective air			`	<u> </u>		_		``			1	1	
5)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(2
3. Heat losse	s and he	eat loss	paramet	er:									
LEMENT	Gros		Openin		Net Ar		U-val		AXU		k-value		ΑXk
	area	(m²)	m	12	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²-	K	kJ/K
oors					2.4	Х	1	=	2.4				(2
/indows Type					4.16		/[1/(1.4)+	1	5.52	Ľ			(2
/indows Type	2			\	4.8	x1.	/[1/(1.4)+	0.04] =	6.36	빝.			(2
/alls Type1	24		8.96		15.04	X	0.18	=	2.71	_		_	(2
/alls Type2	24		2.4		21.6	Х	0.18	=	3.89			╛┕	(2
/alls Type3	2.4		0		2.4	X	0.18	= [0.43				(2
otal area of e					50.4								(;
for windows and include the area						ated using	formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragraph	3.2	
abric heat los				is and pan	uuons		(26)(30)) + (32) =				21.3	31 (
eat capacity	•	`	O ,						.(30) + (32)	2) + (32a).	(32e) =	546.	
hermal mass		,	P = Cm -	- TFA) ir	n kJ/m²K				tive Value	, , ,	, ,	250	
or design assess	•	•		,			ecisely the	e indicative	values of	TMP in Ta	able 1f	200	
an be used inste	ad of a de	tailed calc	ulation.										
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						2.5	2 (
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(22) 1	(26) -				
otal fabric he		alaulataa	المدمدال						(36) =	25\m v (5)		23.8	33 (3
entilation hea			·		lun	1,,1	۸۰۰۰	``		25)m x (5)		1	
8)m= 30.94	Feb 30.8	Mar 30.66	Apr 30	29.88	Jun 29.31	Jul 29.31	Aug 29.2	Sep 29.53	Oct 29.88	Nov 30.13	30.39		(;
,			<u> </u>	20.00	20.01	20.01		<u> </u>		<u> </u>	1 30.33	l	(
eat transfer o			F0.00	E0 74	F0.44	F0.44	F0.00	r	= (37) + (37)		F4.04	l	
9)m= 54.77	54.62	54.48	53.83	53.71	53.14	53.14	53.03	53.36	53.71	53.95	54.21	l	

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
0.99	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.97	0.97	0.98	0.98		
umber of day	s in mor	nth (Tabl	le 1a)		-		-		Average =	Sum(40) ₁ .	12 /12=	0.98	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
. Water heat	ing ener	gy requi	rement:								kWh/ye	ear:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		84		(42
nnual averageduce the annual t more that 125	l average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.91		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	able 1c x	(43)						
4)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		— ,,
ergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		934.88	(44
5)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
					7 .				Total = Su	m(45) ₁₁₂ =		1225.78	(4
nst <mark>antane</mark> ous w											1		
ater storage	16.67 loss:	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(4
orage volum		includin	g any so	olar or W	WHRS	storage	within sa	me ves	sel		150		(4
community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
ater storage) If manufact		eclared le	oss facto	or is kno	wn (kWh	n/dav):				1	39		(4
emperature fa					(.,, , .					54		(4
nergy lost fro				ear			(48) x (49)	=			75		` (5
) If manufact			-										
ot water stora community h	-			e 2 (kW	h/litre/da	ıy)					0		(!
olume factor	_		JII 4 .5								0		(!
emperature fa	actor fro	m Table	2b							-	0		(!
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(!
nter (50) or (54) in (5	55)								0.	75		(!
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
3)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(!
cylinder contains	dedicated	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
imary circuit	loss (an	nual) fro	m Table	3	-		-		-		0		(5
imary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
illiary offourt					,								
(modified by					•		, ,		r thermo	stat)			

Combi I	loss cal	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)	ım						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		(62)
Solar DH	W 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 ad	ditional	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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	134.18	150.42	158.43	169.67		_
								Οι	utput from wa	ater heate	r (annual)₁	12	1774.4	(64)
Heat ga	ains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	79.53	70.63	75.41	69.32	69.18	63.6	62.79	66.55	65.7	71.8	73.76	78.2		(65)
includ	de (57)r	n in calc	culation o	of (65)m	only if o	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a):									
Metabo	lic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>ting</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	14.88	13.21	10.74	8.13	6.08	5.13	5.55	7.21	9.68	12.29	14.34	15.29		(67)
Applian	i <mark>ce</mark> s gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	16 0.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooking	g gains	(calcula	ited in A	pendix	L, equat	ion L15	or L15a)	, also	see Table	5				
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61		(71)
Water h	neating	gains (T	able 5)											
(72)m=	106.9	105.1	101.36	96.28	92.98	88.34	84.39	89.45	91.25	96.5	102.44	105.11		(72)
Total in	nternal	gains =	1			(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	'1)m + (72)	m		
(73)m=	335.82	334.02	323.62	307	290.37	274.19	263.57	268.63	3 277.09	293.89	313.16	327.36		(73)
6. Sola	ar gains	:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		ccess Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
West	_							-					` '	7,000
West	0.9x	0.77	X	4.1		-	9.64	X	0.63		0.7	=	24.97	(80)
West	0.9x	0.77	x	4.8			9.64	X	0.63		0.7	=	28.81	(80)
West	0.9x	0.77	X	4.1		-	88.42	X	0.63	x	0.7	=	48.85	(80)
44G91	0.9x	0.77	Х	4.8	В	x 3	88.42	X	0.63	x	0.7	=	56.36	(80)

			_		_		_		_				
West	0.9x	0.77	X	4.16	X	63.27	X	0.63	X	0.7	=	80.44	(80)
West	0.9x	0.77	X	4.8	X	63.27	X	0.63	X	0.7	=	92.82	(80)
West	0.9x	0.77	X	4.16	X	92.28	X	0.63	X	0.7	=	117.32	(80)
West	0.9x	0.77	X	4.8	X	92.28	X	0.63	X	0.7	=	135.37	(80)
West	0.9x	0.77	X	4.16	X	113.09	X	0.63	x	0.7	=	143.78	(80)
West	0.9x	0.77	X	4.8	X	113.09	X	0.63	x	0.7	=	165.9	(80)
West	0.9x	0.77	x	4.16	x	115.77	X	0.63	×	0.7	=	147.18	(80)
West	0.9x	0.77	x	4.8	x	115.77	X	0.63	X	0.7	=	169.83	(80)
West	0.9x	0.77	x	4.16	x	110.22	X	0.63	x	0.7	=	140.13	(80)
West	0.9x	0.77	x	4.8	x	110.22	X	0.63	×	0.7	=	161.68	(80)
West	0.9x	0.77	x	4.16	x	94.68	X	0.63	X	0.7	=	120.37	(80)
West	0.9x	0.77	x	4.8	x	94.68	X	0.63	x	0.7	=	138.88	(80)
West	0.9x	0.77	x	4.16	x	73.59	X	0.63	x	0.7	=	93.56	(80)
West	0.9x	0.77	x	4.8	x	73.59	X	0.63	X	0.7	=	107.95	(80)
West	0.9x	0.77	x	4.16	X	45.59	X	0.63	x	0.7	=	57.96	(80)
West	0.9x	0.77	x	4.8	x	45.59	X	0.63	X	0.7	=	66.88	(80)
West	0.9x	0.77	x	4.16	х	24.49	X	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	x	4.8	X	24.49	Х	0.63	X	0.7	=	35.92	(80)
West	0.9x	0.77	x	4.16	x	16.15	x	0.63	X	0.7	_	20.53	(80)
West	0.9x	0.77	x	4.8	х	16.15] x	0.63	x	0.7	_ =	23.69	(80)
							7						
				,	AL.		(02)-	Cum (74)m	(00)				
Solar g	ains in	watts, calcu	ated	for each mor	ith		(83)11	$n = Sum(74)m \dots$.(82)m			_	
Solar g (83)m=	ains in 53.78		ated 3.26	252.69 309.6		17.01 301.81	259		.(82)m 124.8	_	44.23]	(83)
(83)m=	53.78	105.21 173	3.26		8 3		ì			_	44.23		(83)
(83)m=	53.78	105.21 173 nternal and s	3.26	252.69 309.6	m + (ì	.25 201.51		4 67.06	44.23 371.59]	(83) (84)
(83)m= Total g	53.78 ains — ii 389.6	105,21 173 nternal and s 439,23 496	3.26 solar 5.88	252.69 309.6 (84)m = (73)	m + (05 5	83)m , watts	259	.25 201.51	124.8	4 67.06]	, ,
(83)m= Total g (84)m= 7. Mea	53.78 ains — ii 389.6 an inter	105.21 173 nternal and s 439.23 496 nal tempera	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73) 559.69 600.0 (heating seas	05 5 000)	83)m , watts	259 527	.88 478.6	124.8	4 67.06		21	, ,
Total g (84)m= 7. Mea	53.78 ains — ii 389.6 an inter erature	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73) 559.69 600.0 (heating seas	05 (500) 000)	83)m , watts 91.2 565.38 area from Ta	259 527	.88 478.6	124.8	4 67.06		21	(84)
Total g (84)m= 7. Mea	53.78 ains — ii 389.6 an inter erature	nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73) 559.69 600.6 (heating seaseriods in the l	on) iving ,m (s	83)m , watts 91.2 565.38 area from Ta	527 ble 9	.88 478.6	124.8	3 380.21		21	(84)
Total g (84)m= 7. Mea	53.78 ains – in 389.6 an inter erature tion fac	105.21 173 nternal and s 439.23 496 nal tempera during heati stor for gains Feb A	3.26 solar 5.88 ture (ng po	252.69 309.6 (84)m = (73) 559.69 600.0 (heating seaseriods in the leaving area, h1	05 5 00n) iving ,m (s	watts 91.2 565.38 area from Talee Table 9a)	527 ble 9	.88 478.6 , Th1 (°C)	124.8	3 380.21	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1	105.21 173 nternal and s 439.23 496 nal tempera during heati stor for gains Feb N 0.99 0.	solar 5.88 ture (ng po for li	252.69 309.6 (84)m = (73) 559.69 600.6 (heating seaseriods in the living area, h1 Apr Ma 0.91 0.76	on) iving ,,m (s	83)m , watts 91.2 565.38 area from Ta ee Table 9a) Jun Jul	259 527 ble 9	.88 478.6 , Th1 (°C) ug Sep	124.8 418.7	3 380.21 Nov	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1	nternal and standard during heatietor for gains Feb N 0.99 0. I temperatur	solar 5.88 ture (ng po for li	252.69 309.6 (84)m = (73) 559.69 600.6 (heating seaseriods in the living area, h1 Apr Ma 0.91 0.76	on) iving ,m (s	83)m , watts 991.2 565.38 area from Talee Table 9a) Jun Jul 0.57 0.41	259 527 ble 9	.25 201.51 .88 478.6 , Th1 (°C) ug Sep 16 0.72 Table 9c)	124.8 418.7	4 67.06 3 380.21 Nov 0.99	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	53.78 ains – ii 389.6 an interestion factor Jan 1 interna 20.08	nal tempera during heatietor for gains Feb N 0.99 0. I temperatur 20.22 20	3.26 solar 5.88 ture (ng po for li far 97 e in l .46	252.69 309.6 (84)m = (73) 559.69 600.6 (heating seaseriods in the living area, h1 Apr Ma 0.91 0.76 iving area T1 20.75 20.9	on) iving ,m (s	area from Talee Table 9a) Jun Jul 0.57 0.41 w steps 3 to 20.99 21	259 527 ble 9 A 0.4 7 in T	.25 201.51 .88 478.6 , Th1 (°C) ug Sep .6 0.72 Table 9c) 1 20.96	124.8 418.7 Oct 0.94	4 67.06 3 380.21 Nov 0.99	371.59 Dec 1	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	53.78 ains – ii 389.6 an interestion factor Jan 1 interna 20.08	105.21 173 nternal and s 439.23 496 nal tempera during heati stor for gains Feb N 0.99 0. I temperatur 20.22 20 during heati	3.26 solar 5.88 ture (ng po for li far 97 e in l .46	252.69 309.6 (84)m = (73) 559.69 600.6 (heating seaseriods in the living area, h1 Apr Ma 0.91 0.76 iving area T1 20.75 20.9	on) iving ,m (s y (follo	83)m , watts 91.2	259 527 ble 9 A 0.4 7 in T	.88 478.6 Th1 (°C) ug Sep 16 0.72 Table 9c) 1 20.96 9, Th2 (°C)	124.8 418.7 Oct 0.94	4 67.06 3 380.21 Nov 0.99	371.59 Dec 1	21	(84)
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Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.98 0.96 0.89 0.73 0.53 0.37 0.41 0.68 0.93 0.98 0.99 Useful gains, hmGm, W = (94)m x (84)m (95)m= 386.7 432.64 477.65 496.15 439.3 310.88 208.45 218.27 325.84 387.47 374.24 369.41 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m) 1 (97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98)s
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm: (94)m= 0.99
(94)m=
Useful gains, hmGm , W = (94)m x (84)m (95)m= 386.7 432.64 477.65 496.15 439.3 310.88 208.45 218.27 325.84 387.47 374.24 369.41 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98) _{159.12} = 1530.08 (98) Space heating requirement in kWh/m²/year
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(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)m Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 (97)m = 828.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m =
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1530.08 (98) Space heating requirement in kWh/m²/year 27.77 (99)
(98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1530.08 (98) Space heating requirement in kWh/m²/year 27.77 (99)
Total per year (kWh/year) = Sum(98) _{15,912} = 1530.08 (98) Space heating requirement in kWh/m²/year (27.77 (99)
Space heating requirement in kWh/m²/year 27.77 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (20
Fraction of space heat from main system(s) (202) = 1 - (201) =
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1
Efficiency of secondary/supplementary heating system, %
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above) 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (213)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (214)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (215)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (216)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (217)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times $
Total (kWh/year) = Sum(211) ₁₅₁₀₁₂ = 1636.45 (21
Space heating fuel (secondary), kWh/month $= \{[(98)m \times (201)] \} \times 100 \div (208)$
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0
Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)
Water heating
Output from water heater (calculated above)
173.68 153.24 161.29 145.09 142.54 127.89 123.32 134.64 134.18 150.42 158.43 169.67
Efficiency of water heater 79.8 (21)
(217)m= 86.49 86.11 85.23 83.39 81.14 79.8 79.8 79.8 79.8 83.66 85.72 86.62 (21)
Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m
(219)m= 200.81 177.96 189.25 173.99 175.68 160.26 154.53 168.72 168.15 179.81 184.82 195.88 Total = Sum(219a), 12 = 2129.86 (219)m= 200.81 177.96 189.25 173.99 175.68 160.26 154.53 168.72 168.15 179.81 184.82 195.88 (219)m= 200.81 177.96 189.25 173.99 175.68 160.26 154.53 168.72 168.15 179.81 184.82 195.88
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 1636.45
1000.40

					,
Water heating fuel used				2129.86	_
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				262.71	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4104.02	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	353.47	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	460.05	(264)
Space and water heating	(261) + (262) + (263) + (264) =			813.52	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	136.34	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		988.79	(272)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Flat Dwelling type:

Detachment:

2022 Year Completed:

Floor Location: Floor area:

> Storey height: 66.25 m² 3 m

Floor 0

27.2 m² (fraction 0.411) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	F <mark>rame</mark> :
DOOR	Manufactur	er Solid			Wood
Balcon	y Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	
N	Manufactur	er Windows	low-E, En = 0.05	s, soft coat No	
E	Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:	
DOOR	mm	0.7	0	1.4	2.4	1	
Balcony		0.7	0.4	1	4.8	1	
N		0.7	0.4	1	5.44	1	
F		0.7	0.4	1	1 44	1	

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
Balcony		N	North	0	0
N		N	North	0	0
E		Е	East	0	0

Overshading: Heavy

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elem	nents						
N	10.24	10.24	0	0.15	0	False	N/A
E	1.44	1.44	0	0.15	0	False	N/A
INT	13.2	2.4	10.8	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Floor	66.25			0.11			N/A

Internal Elements Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma	FSAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty	Address	: Sample	e 1 (Bott	om)			
Address :											
1. Overall dwelling dime	ensions:			A ===	a (res 2 \		Av. Ha	: a.b.4/\		Value a/m²	1
Ground floor					a(m²) 66.25	(1a) x		ight(m)	(2a) =	Volume(m ²	(3a)
Total floor area TFA = (1	a)+(1b)+(1d	:)+(1d)+(1e	e)+(1ı	ገ) 6	6.25	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	198.75	(5)
2. Ventilation rate:											
Number of chimneys	main heatir		econdar neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ı r
Number of open flues		 	0	╡ᆠ╞	0	_	0	x	20 =	0	(6b)
Number of intermittent fa						J		x	10 =		(7a)
Number of passive vents						Ļ	0		10 =	0	╡`′
						Ļ	0		40 =	0	(7b)
Number of flueless gas f	ires					L	0	X '	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flu <mark>es an</mark>	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b			ed, procee	ed to (17),	otherwise (continue fr	om (9) to ((16)			_
Number of storeys in t Additional infiltration	he dwelling	(ns)						[(0)	11,0 1	0	(9)
Structural infiltration: 0	25 for stee	l or timber	frame o	. 0.35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	dollori			0	(\\
deducting areas of openi				4 / 1							_
If suspended wooden		,	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en Percentage of window			trinned							0	(13)
Window infiltration	3 and doors	draugitt 3	пррси		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expres	ssed in cut	oic metre	es per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabi	lity value, th	en (18) = [(1	7) ÷ 20]+(8), otherw	ise (18) =	(16)				0.15	(18)
Air permeability value applie		sation test ha	s been doi	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelters Shelter factor	ed				(20) – 1 -	[0.075 x (1	19)1 –			2	(19)
Infiltration rate incorpora	ting shelter	factor			(23) = 1 (21) = (18)	`				0.85	= (20)
Infiltration rate modified t	•		4		(-1) - (10	, ^ (20) -				0.13	(21)
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp			1 5011	1 001	1 ,,,,,,	ı Oop	1 000	1 1101	1 200	J	
(22)m= 5.1 5	4.9 4.4	i	3.8	3.8	3.7	4	4.3	4.5	4.7]	
		·			1	ı	ı	1	1	ı	
Wind Factor (22a)m = (2			ı	ı	ı	ı	ı	Γ	Γ	1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	_			i	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calcul ate effec If mechanica		-	rate for t	пе арріі	саріе са	se						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23)
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mecha	anical ve	entilation	with he	at recov	erv (MVI	HR) (24a	a)m = (22	2b)m + (23b) x [1 – (23c)		(
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	covery (N	иV) (24t)m = (22	2b)m + (23b)	<u>l</u>		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole he				•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v				•	•				0.51	·	ļ	I	
24d)m= 0	0	0	0	0	0	0	0.5 1 [(2	0	0.01	0	0		(24
Effective air	change	rate - er	ter (24a	L) or (24b	o) or (24	c) or (24	d) in box	(25)	ļ				
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors		,,,	Ü		2.4	x	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				4.8	X	1/[1/(1)+	0.04] =	4.62	Ħ			(27
Vindows Type					5.44		1/[1/(1)+		5.23	Ħ			(27
Vindows Type					1.44	-	1/[1/(1)+	0.04] =	1.38	4			(27
loor					66.25	 	0.11		7.2875			-	(28
Valls Type1	10.2	24	10.2	4	0	x	0.15	-	0				(29
Valls Type2	1.4		1.44	=	0	^	0.15	-	0	ᆿ ¦		3	(29
Valls Type3	13.2		2.4		10.8	_	0.15		1.62	믁 ¦		-	(29
Valls Type4	2.4		0			i x	0.13	=	0.84	믁 ¦		-	(29
otal area of el					2.4	=	0.35	= [0.64	[
for windows and it	roof wind	ows, use e					ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	(3*
abric heat los							(26)(30)) + (32) =				24.34	(33
leat capacity (•	,					((28)	(30) + (32	2) + (32a).	(32e) =	5153.5	ऱ
hermal mass		,	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assessi an be used instea	ments wh	ere the de	tails of the	,			ecisely the	e indicative	e values of	TMP in Ta	able 1f		`
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						14.03	(30
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			38.36	(3:
								(20)	0.00	,			
entilation hea	t loss ca	alculated	d monthly	y				(38)m	$= 0.33 \times ($	(25)m x (5))		

											T		(00)
` '	7.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7		(38)
Heat transfer coe			54.40	5400	50.40	50.40	50.07	· · · ·	= (37) + (3	_	T 55.00		
(39)m= 55.9 5	5.69	55.48	54.43	54.22	53.18	53.18	52.97	53.6	54.22	54.64	55.06	54.38	(39)
Heat loss parame	eter (H	ILP), W/	m²K						= (39)m ÷	Sum(39)₁ (4)	12 / 12=	34.30	(00)
(40)m= 0.84 0).84	0.84	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83		_
Number of days in	n mor	nth (Tabl	le 1a)					/	Average =	Sum(40) ₁	12 /12=	0.82	(40)
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•										•		
4. Water heating	g ener	gy requi	rement:								kWh/ye	ear:	
Assumed occupa	ncv N	J									45		(42)
if TFA > 13.9, N if TFA £ 13.9, N	N = 1 -		[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (ΓFA -13.		.15		(42)
Annual average h		ter usag	ge in litre	s per da	ıy Vd,av	erage =	(25 x N)	+ 36		8	5.3		(43)
Reduce the annual av	•		0,		•	Ū	to achieve	a water us	e target o	f			
	, ,		,				A	0	0-1	Nlavi			
Jan Hot water usage in liti	Feb res per	Mar day for ea	Apr ach month	Vd,m = fa	Jun	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	0.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
(11)= 00.00 0	0.12	01.01	00.0	00.10	70.77	10.71	30.10			m(44) ₁₁₂ =		1023.65	(44)
Ener <mark>gy cont</mark> ent of hot	water i	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 139.15 12	21.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		_
If instantaneous water	r heatin	na at noint	of use (no	hot water	storage)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1342.17	(45)
	8.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage los		10.04	10.42	13.70	13.0	12.0	14.40	14.03	17.03	10.01	20.21		(40)
Storage volume (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community hear	•			•			` '						
Otherwise if no st Water storage los		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufacture		clared l	oss facto	or is kno	wn (kWh	n/dav):					0		(48)
Temperature fact					`	3,					0		(49)
Energy lost from	water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(50)
b) If manufacture			-										
Hot water storage				e 2 (kWl	n/litre/da	ıy)				0.	.02		(51)
If community hear Volume factor from	-		JII 4.3							1	.03		(52)
Temperature fact			2b							-	0.6		(53)
Energy lost from	water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or (54)		-	•								.03		(55)
Water storage los	ss cald	culated f	or each	month			((56)m = (55) × (41)r	n				
(56)m= 32.01 2	8.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains de	dicated	solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 32.01 2	8.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fron	n Table 3					0		(58)
Primary circuit loss calculated fo		59)m = (58) ÷ 36	65 × (41)m					
(modified by factor from Table	,	, , ,	` '	der thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23.26	23.26 22.5	23.26	22.51	23.26		(59)
Combi loss calculated for each r	month (61)m =	(60) ÷ 365 × (41)m					
(61)m= 0 0 0	0 0	0 0	0 0	0	0	0		(61)
Total heat required for water hea	ating calculated	for each month	(62)m = 0.85	× (45)m +	(46)m +	(57)m +	(59)m + (61)m	
	162.99 160.34	144.15 139.29	151.68 151.	- ì	177.59	190.04	(00)	(62)
Solar DHW input calculated using Apper	ndix G or Appendix	H (negative quantit	(enter '0' if no	solar contribut	ion to wate	r heating)		
(add additional lines if FGHRS a						3,		
(63)m= 0 0	0 0	0 0	0 0	0	0	0		(63)
FHRS 17.95 15.96 16.41	14.51 13.96	12.12 11.22	12.87 13.0)2 15.02	16.24	17.46		(63) (G2
Output from water heater								
(64)m= 173.8 153.25 161.77	145.88 143.69	129.44 125.38	136.13 135.	43 151.27	158.76	169.9		
	'	· · · · · · · · · · · · · · · · · · ·	Output fror	n water heate	r (annual) ₁	12	1784.71	(64)
Heat gains from water heating, k	دWh/month 0.2	5 ´ [0.85 × (45)m	ı + (61)m] + 0	.8 x [(46)m	+ (57)m	+ (59)m]	
(65)m= 90.49 80.41 85.98	79.2 79.15	72.94 72.15	76.27 75.2	23 82.02	84.06	89.03		(65)
include (57)m in calculation of	f (65)m only if c	ylinder is in the	dwelling or ho	t wate <mark>r is f</mark> i	rom com	munity h	eating	
5. Internal gains (see Table 5 a	and 5a):							
Metabolic gains (Table 5), Watts	3							
Jan Feb Mar	Apr May	Jun Jul	Aug Se	ep Oct	Nov	Dec		
(66)m= 107.59 107.59 107.59	107.59 107.59	107.59 107.59	107.59 107.	59 107.59	107.59	107.59		(66)
Lighting gains (calculated in App	pendix L, equati	ion L9 or L9a), a	lso see Table	5				
(67)m= 17.65 15.68 12.75	9.65 7.22	6.09 6.58	8.56 11.4	14.58	17.02	18.14		(67)
Appliances gains (calculated in /	Appendix L, eq	uation L13 or L1	3a), also see	Table 5	!			
(68)m= 188.39 190.35 185.42	174.93 161.69	149.25 140.94	138.98 143.	91 154.4	167.64	180.08		(68)
Cooking gains (calculated in App	pendix L, equat	ion L15 or L15a), also see Ta	ble 5				
(69)m= 33.76 33.76 33.76	33.76 33.76	33.76 33.76	33.76 33.7	76 33.76	33.76	33.76		(69)
Pumps and fans gains (Table 5a	a)	•	!					
(70)m= 0 0 0	0 0	0 0	0 0	0	0	0		(70)
Losses e.g. evaporation (negative	ve values) (Tab	le 5)	!!	<u>'</u>	!			
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07 -86.0	07 -86.07	-86.07	-86.07		(71)
Water heating gains (Table 5)	'	•	!	!				
(72)m= 121.63 119.66 115.56	110 106.39	101.3 96.98	102.52 104.	49 110.25	116.75	119.66		(72)
Total internal gains =	,	(66)m + (67)n	n + (68)m + (69)n	n + (70)m + (7	'1)m + (72)	m		
	349.86 330.58	311.92 299.78	305.34 315.	16 334.5	356.68	373.16		(73)
6. Solar gains:								
Solar gains are calculated using solar f	flux from Table 6a	and associated equa	ations to convert t	to the applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux	_ g_		FF		Gains	
Table 6d	m²	Table 6a	Table	6b T	able 6c		(W)	_
North 0.9x 0.77 x	4.8	x 10.63	X 0.4	×	0.7	=	9.9	(74)

	_												
North	0.9x	0.77	X	5.44	X	10.63	X	0.4	X	0.7	=	11.22	(74)
North	0.9x	0.77	X	4.8	X	20.32	X	0.4	Х	0.7	=	18.93	(74)
North	0.9x	0.77	X	5.44	X	20.32	X	0.4	X	0.7	=	21.45	(74)
North	0.9x	0.77	X	4.8	X	34.53	X	0.4	X	0.7	=	32.16	(74)
North	0.9x	0.77	X	5.44	X	34.53	X	0.4	x [0.7	=	36.45	(74)
North	0.9x	0.77	X	4.8	X	55.46	X	0.4	x	0.7	=	51.66	(74)
North	0.9x	0.77	X	5.44	X	55.46	X	0.4	x	0.7	=	58.55	(74)
North	0.9x	0.77	X	4.8	X	74.72	X	0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	X	5.44	X	74.72	X	0.4	x	0.7	=	78.87	(74)
North	0.9x	0.77	X	4.8	X	79.99	X	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	5.44	X	79.99	X	0.4	x	0.7	=	84.43	(74)
North	0.9x	0.77	X	4.8	X	74.68	X	0.4	x	0.7	=	69.55	(74)
North	0.9x	0.77	X	5.44	x	74.68	X	0.4	x [0.7	=	78.83	(74)
North	0.9x	0.77	X	4.8	x	59.25	X	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	X	5.44	X	59.25	X	0.4	x	0.7	=	62.54	(74)
North	0.9x	0.77	X	4.8	X	41.52	X	0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	X	5.44	X	41.52	X	0.4	x	0.7	=	43.82	(74)
North	0.9x	0.77	X	4.8	X	24.19	X	0.4	Х	0.7	=	22.53	(74)
North	0.9x	0.77	×	5.44	x	24.19	x	0.4	х	0.7	_	25.53	(74)
North	0.9x	0.77	X	4.8	х	13.12		0.4	х	0.7	=	12.22	(74)
North	0.9x	0.77	x	5.44	X	13.12	X	0.4	х	0.7	=	13.85	(74)
North	0.9x	0.77	X	4.8	x	8.86	Х	0.4	х	0.7	=	8.26	(74)
North	0.9x	0.77	x	5.44	X	8.86	X	0.4	х	0.7	=	9.36	(74)
East	0.9x	0.77	×	1.44	х	19.64	X	0.4	х	0.7	=	5.49	(76)
East	0.9x	0.77	x	1.44	x	38.42	X	0.4	x	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.44	X	63.27	X	0.4	x	0.7	=	17.68	(76)
East	0.9x	0.77	x	1.44	X	92.28	X	0.4	x	0.7	=	25.78	(76)
East	0.9x	0.77	X	1.44	X	113.09	X	0.4	x	0.7	=	31.6	(76)
East	0.9x	0.77	X	1.44	X	115.77	X	0.4	x	0.7	=	32.35	(76)
East	0.9x	0.77	X	1.44	X	110.22	x	0.4	x	0.7	=	30.8	(76)
East	0.9x	0.77	X	1.44	X	94.68	X	0.4	x	0.7	=	26.45	(76)
East	0.9x	0.77	X	1.44	X	73.59	X	0.4	x	0.7	=	20.56	(76)
East	0.9x	0.77	X	1.44	X	45.59	X	0.4	x	0.7	=	12.74	(76)
East	0.9x	0.77	x	1.44	x	24.49	x	0.4	x [0.7		6.84	(76)
East	0.9x	0.77	x	1.44	x	16.15	x	0.4	×	0.7	=	4.51	(76)
							_						
Solar g	ains in	watts, calc	ulated	for each m	onth		(83)n	n = Sum(74)m	(82)m		,	•	
(83)m=	26.62		86.29			91.28 179.1		.17 103.05	60.8	32.91	22.13		(83)
Ī			- 1	<u> </u>		(83)m , watts			1			1	4
(84)m=	409.56	432.07	455.3	485.85 51	0.63	503.2 478.9	6 449	.51 418.21	395.3	389.59	395.29		(84)
7. Me	an interi	nal tempei	rature	(heating se	ason)								
Temp	erature	during hea	ating p	eriods in th	e living	area from T	Table 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gair	ns for I	iving area,	h1,m (s	see Table 9a	a)					 1	
	Jan	Feb	Mar	Apr	May	Jun Jul	A	ug Sep	Oct	Nov	Dec		
04	-0.4 -0.04		0 = = 4 (CAD 0 02) h	. ,,	_						_	5 of 7

(86)m= 1 1 0.99 0.96 0.86 0.66 0.49 0.54 0.81 0.97 0.99 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_
(87)m= 20.21 20.3 20.47 20.71 20.9 20.99 21 21 20.95 20.73 20.44 20.2	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	
(88)m= 20.22 20.22 20.22 20.23 20.24 20.25 20.25 20.25 20.25 20.24 20.23 20.2	3 (88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.99 0.95 0.82 0.59 0.4 0.45 0.75 0.96 0.99 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 19.16 19.29 19.53 19.89 20.14 20.24 20.25 20.25 20.21 19.92 19.5 19.1	5 (90)
fLA = Living area ÷ (4) =	0.41 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 19.59 19.7 19.92 20.23 20.46 20.55 20.56 20.56 20.51 20.25 19.89 19.5	8 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(03)
(93)m= 19.59 19.7 19.92 20.23 20.46 20.55 20.56 20.56 20.51 20.25 19.89 19.5 8. Space heating requirement	8 (93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-co	alculate
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	С
Utilisation factor for gains, hm:	¬ (04)
(94)m= 1 0.99 0.98 0.95 0.84 0.62 0.44 0.49 0.77 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m	(94)
(95)m= 407.75 428.97 447.98 460.55 426.73 311.12 210.01 219.38 322.79 378.38 385.92 393.8	(95)
Monthly average external temperature from Table 8	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	_
(97)m= 854.66 824.31 744.35 616.55 474.78 316.34 210.46 220.27 343.8 523.3 698.67 846.9	93 (97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m = 332.5 265.66 220.5 112.32 35.75 0 0 0 0 107.82 225.18 337.09	18
Total per year (kWh/year) = Sum(98) ₁₅₉₁₇	
Space heating requirement in kWh/m²/year	24.71 (99)
<u> </u>	24.71
9b. Energy requirements – Community heating schemeThis part is used for space heating, space cooling or water heating provided by a community scheme.	
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat source	s; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	
Fraction of heat from Community boilers	1 (303a
Fraction of total space heat from Community boilers (302) x (303a) =	1 (304a
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	1636.82

Space heat from Community boilers		(98) x (304a) x	(305) x (306) =	1718.66	(307a)
Efficiency of secondary/supplementary h	eating system in % (from			0](308
Space heating requirement from secondary			,	0	(309)
	ary/supplementary system	(33) x (331) x 1	00 : (000) =	0](000)
Water heating Annual water heating requirement				1784.71	1
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	1873.94	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	(e) + (310a)(310e)] =	35.93	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extrac		utside		118.21	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330l	b) + (330g) =	118.21	(331)
Energy for lighting (calculated in Append	ix L)			311.73	(332)
Total delivered energy for all uses (307)	+ (309) + (310) + (312) +	(315) + (331) + (331)	32)(237b) =	4022.53	(338)
12b. CO2 Emissions – Community heating		Energy kWh/year	Emission factor	Emissions kg CO2/year	
CO2 from other sources of space and was Efficiency of heat source 1 (%)	ater heating (not CHP)	kWh/year	Emission factor	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and wa	ater heating (not CHP) If there is CHP using tw	kWh/year	Emission factor kg CO2/kWh	kg CO2/year	(367a) (367)
CO2 from other sources of space and wa Efficiency of heat source 1 (%)	If there is CHP using tw	kWh/year wo fuels repeat (363) to	Emission factor kg CO2/kWh	95 816.84	J .
CO2 from other sources of space and wa Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using tw [(307b)+(31	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	95 816.84 18.65	(367)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP using tw [(307b)+(31) [(33) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34) [(34	kWh/year yo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	95 816.84 18.65 835.49	(367)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy	If there is CHP using tw [(307b)+(31) [(3:35tems)] (36) (30)	kWh/year wo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 33)(366) + (368)(372	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	95 816.84 18.65 835.49	(367) (372) (373)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second	If there is CHP using tw [(307b)+(31) [(3:35tems (36) 20ndary) (30) 20n heater or instantaneous	kWh/year wo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 33)(366) + (368)(372	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	95 816.84 18.65 835.49](367)](372)](373)](374)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second community sy) CO2 associated with water from immersion	If there is CHP using tw [(307b)+(31) [(3) stems (36) ondary) (30) on heater or instantaneous ter heating (37)	kWh/year wo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 33)(366) + (368)(372 99) x us heater (312) x 23) + (374) + (375) =	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	95 816.84 18.65 835.49 0](367)](372)](373)](374)](375)
CO2 from other sources of space and was Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (second community sy) CO2 associated with water from immersion total CO2 associated with water from immersion total CO2 associated with space and was	stems (36 condary) (30 con heater or instantaneous ter heating (37 condans within dwelling)	kWh/year wo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 33)(366) + (368)(372 99) x us heater (312) x 23) + (374) + (375) =	Emission factor kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22	95 816.84 18.65 835.49 0 835.49 61.35](367)](372)](373)](374)](375)](376)
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				User D	etails:						
Assessor Name:					Strom	a Num	ber:				
Software Name:	Stroma FS	SAP 201	2		Softwa	are Ve	rsion:		Versio	n: 1.0.5.51	
			Р	roperty.	Address	Sample	e 1 (Bott	om)			
Address :											
Overall dwelling dime	ensions:			۸ro	a(m²)		Λν Hο	ight(m)		Volume(m ³	31
Ground floor					<u> </u>	(1a) x	AV. HE	3	(2a) =	198.75	(3a
Total floor area TFA = (1	a)+(1h)+(1c)+	.(1d)_(1o	.\⊥ (1r			(4)]` ′		`
	α) ((15) ((15) ((14)1(16	,, , , , , , , , , , , , , , , , , , , ,	')	0.23)+(3c)+(3c	4)+(30)+	(3n) -		7,5
Dwelling volume						(3a)+(3b)+(30)+(30	ı)+(3e)+	.(311) =	198.75	(5)
2. Ventilation rate:	main	94	econdai	'V	other		total			m³ per hou	ır
NI salas afallas a	heating	<u>_h</u>	eating	-		, ,			40	-	
Number of chimneys	0	╛╵	0	<u></u>	0	<u> </u>	0		40 =	0	(6a
Number of open flues	0	+	0	_] +	0] = <u>[</u>	0	x :	20 =	0	(6b
Number of intermittent fa	ns						2	X	10 =	20	(7a
Number of passive vents							0	X ·	10 =	0	(7b
Number of flueless gas fi	res						0	X 4	40 =	0	(7c
						_			A I		
						_		<u> </u>		nanges per ho	our —
Infiltration due to chimne						antinua fi	20		÷ (5) =	0.1	(8)
If a pressurisation test has b Number of storeys in the			ea, procee	a 10 (17), (otnerwise (onunue ir	OIII (9) 10 ((10)		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0	.25 for steel o	r timber t	frame or	0.35 fo	r masoni	y consti	ruction			0	(11
if both types of wall are padeducting areas of openia			ponding to	the great	er wall are	a (after					
If suspended wooden f	• /		ed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en	ter 0.05, else	enter 0								0	(13
Percentage of windows	s and doors d	raught st	ripped							0	(14
Window infiltration					0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate							12) + (13) -			0	(16
Air permeability value,					•	•	etre of e	envelope	area	5	(17
If based on air permeabil Air permeability value applie	-						is heina u	sad		0.35	(18
Number of sides sheltere		on tool nac	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	io oi a aog	groo an po	modbinty	io boilig at	50 u		2	(19
Shelter factor					(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20
Infiltration rate incorporat	ing shelter fa	ctor			(21) = (18	x (20) =				0.3	(21
Infiltration rate modified f	or monthly wi	nd speed	l						•		
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7								1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4										
	1.23	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

Adjusted infiltr	ation rate	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		•		i	
0.38 Calculate effe	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
If mechanica		•	iale ioi l	пе аррп	cable ca	3E						0	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	лV) (24b	m = (22)	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					.5 × (23b))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n									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		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	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. Heat losse	s and he	eat loss r	naramet	jr.					_				
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value)	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>					2.4	Х	1	=	2.4				(26
Vindows Type	1				4.8	x1.	/[1/(1.4)+	0.04] =	6.36				(27
Vindows Type	2				5.44	x1.	/[1/(1.4)+	0.04] =	7.21				(27
Vindows Type	3				1.44	х1	/[1/(1.4)+	0.04] =	1.91				(27
loor					66.25	5 X	0.13	=	8.61249	9			(28
Valls Type1	10.2	4	10.2	4	0	X	0.18	=	0	\Box [(29
Valls Type2	1.44	4	1.44		0	Х	0.18	=	0				(29
Valls Type3	13.2	2	2.4		10.8	Х	0.18	=	1.94				(29
Valls Type4	2.4		0		2.4	х	0.18	=	0.43	$\overline{}$		$\neg \ $	(29
otal area of e	lements	, m²			93.53	3						_	(3
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions		(26) (20	\					——
abric heat los		•	U)				(26)(30	, , ,	(20) : (20	2) . (22-)	(20-)	28.87	=
leat capacity	,	•	. Cm	T[. l. l/m2l/			,	(30) + (32	, , ,	(32e) =	5153.5	
hermal mass for design assess	•	`		,			ecisely the		tive Value		ahla 1f	250	(3
an be used inste				JOHSHUCL	ion ale 110	. AHOWH PI	ooiseiy uit	, maicanyt	, vaiu c s Ul	rivii III I (abic II		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						4.68	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)								
otal fabric he									(36) =			33.55	5 (3
entilation hea			·						= 0.33 × () 	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

											1		ı	
(38)m=	37.53	37.35	37.16	36.32	36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38)
Heat to	ansfer o	oefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	71.08	70.89	70.71	69.87	69.71	68.97	68.97	68.84	69.26	69.71	70.03	70.37		_
Heat lo	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} - (4)	12 /12=	69.87	(39)
(40)m=	1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.04	1.05	1.05	1.06	1.06		_
Niconala			ath /Tab	la 4a\					,	Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Numbe		Feb	nth (Tab		Mov	lup	Jul	Λιια	Sep	Oct	Nov	Dec		
(41)m=	Jan 31	28	Mar 31	Apr 30	May 31	Jun 30	31	Aug 31	30	31	30	31		(41)
(41)111–		20				30			30	J1] 30	J 31		(,
4 10/												1.20/1./		
4. VV	ater heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
	ned occu											.15		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.	.9)			
		•	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		8!	5.3		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	welling is	designed t	to achieve		se target o		0.0		(- /
not mor	e that 125	litres per	person per	r day (all w		not and co	la)						ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat		n litres pei	day for ea	ach month			able 1c x	(43)						
(44)m=	93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		¬
Energy	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1023.65	(44)
(45)m=	139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
							1 0:			Γotal = Su	m(45) ₁₁₂ =	=	1342.17	(45)
If instan	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)		1	1	ı	
(46)m=	20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
	storage		includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
_		, ,	ind no ta	•			•		A1110 VOO	001		150		(47)
		-			-			mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:									•			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	.39		(48)
Tempe	erature f	actor fro	m Table	2b							0.	.54		(49)
			storage	-				(48) x (49)) =		0.	.75		(50)
,			eclared of factor fr	-								0		(51)
		•	ee secti		C 2 (KVV	11/11110/00	·y <i>)</i>					0		(31)
	e factor	-										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	55)								0.	.75		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylind	er contains	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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) fro	m Table 3				0	1	(58)
Primary circuit loss calculated for		59)m = (58) ÷ 3	65 × (41)m			•	
(modified by factor from Table	e H5 if there is s	solar water heat	ing and a cylinde	er thermostat)		_	
(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 calculated for each	month (61)m =	(60) ÷ 365 × (41	I)m				
(61)m= 0 0 0	0 0	0 0	0 0	0 0	0	1	(61)
Total heat required for water he	eating calculated	for each month	n (62)m = 0.85 ×	(45)m + (46)m ·	+ (57)m +	(59)m + (61)m	
(62)m= 185.75 163.79 172.18	154.58 151.65	135.75 130.6	143 142.64	160.28 169.19	181.36]	(62)
Solar DHW input calculated using Appe	endix G or Appendix	H (negative quanti	ty) (enter '0' if no sola	ar contribution to wa	ter heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, see Ap	opendix G)			_	
(63)m= 0 0 0	0 0	0 0	0 0	0 0	0		(63)
FHRS 0 0 0	0 0	0 0	0 0	0 0	0	-	(63) (G2
Output from water heater							
(64)m= 185.75 163.79 172.18	154.58 151.65	135.75 130.6	143 142.64	160.28 169.19	181.36		_
			Output from w	ater heater (annual)112	1890.79	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (45)r	n + (61)m] + 0.8	x [(46)m + (57)r	n + (59)m	1]	
(65)m= 83.54 74.14 79.03	72.48 72.21	66.22 65.21	69.33 68.51	75.08 77.34	82.08		(65)
include (57)m in calculation of	of (65)m only if c	ylinder is in the	dwelling or hot w	vate <mark>r is from co</mark> r	nmunity h	neating	
5. Internal gains (see Table 5	and 5a):						
Metabolic gains (Table 5), Watt	S						
Jan Feb Mar	Apr May	Jun <mark>Jul</mark>	Aug Sep	Oct Nov	Dec		
(66)m= 107.59 107.59 107.59	107.59 107.59	107.59	107.59 107.59	107.59 107.59	107.59		(66)
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or L9a), a	also see T <mark>able 5</mark>				
(67)m= 17.21 15.29 12.43	9.41 7.04	5.94 6.42	8.34 11.2	14.22 16.59	17.69]	(67)
Appliances gains (calculated in	Appendix L, eq	uation L13 or L	13a), also see Ta	able 5		-	
(68)m= 188.39 190.35 185.42	174.93 161.69	149.25 140.94	138.98 143.91	154.4 167.64	180.08		(68)
Cooking gains (calculated in Ap	pendix L, equat	tion L15 or L15a	a), also see Table	e 5		•	
(69)m= 33.76 33.76 33.76	33.76 33.76	33.76 33.76	33.76 33.76	33.76 33.76	33.76		(69)
Pumps and fans gains (Table 5	a)	-	-	-		•	
(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)
Losses e.g. evaporation (negati	ive values) (Tab	ole 5)	•	•	-	•	
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07		(71)
Water heating gains (Table 5)	•	•	•	•	_	•	
(72)m= 112.29 110.32 106.23	100.67 97.05	91.97 87.65	93.18 95.15	100.91 107.41	110.33		(72)
Total internal gains =	•	(66)m + (67)ı	m + (68)m + (69)m +	(70)m + (71)m + (7	2)m	•	
(73)m= 376.17 374.23 362.36	343.29 324.06	305.44 293.28	298.79 308.54	327.8 349.92	366.38]	(73)
6. Solar gains:					•		
Solar gains are calculated using solar	flux from Table 6a	and associated equ	ations to convert to tl	he applicable orient	ation.		
Orientation: Access Factor	Area	Flux	g_ Toble 6b	FF Table 60		Gains	
Table 6d	m²	Table 6a	Table 6b	Table 6c	; 	(W)	-
North 0.9x 0.77 x	4.8	x 10.63	x 0.63	X 0.7	=	15.6	(74)

North	0.9x	0.77		Κ [5.44	X	10	0.63	X	0.63	X	0.7	=	17.68	(74)
North	0.9x	0.77	;	κ [4.8	X	20	0.32	X	0.63	X	0.7	=	29.81	(74)
North	0.9x	0.77		κ [5.44	X	20	0.32	X	0.63	X	0.7	=	33.78	(74)
North	0.9x	0.77		κ [4.8	x	34	1.53	x	0.63	x	0.7	=	50.65	(74)
North	0.9x	0.77		(5.44	x	34	1.53	x	0.63	х	0.7	=	57.41	(74)
North	0.9x	0.77		ĸ [4.8	x	55	5.46	x	0.63	x	0.7	=	81.36	(74)
North	0.9x	0.77		κ [5.44	x	5	5.46	x	0.63	X	0.7	=	92.21	(74)
North	0.9x	0.77		· [4.8	x	74	1.72	x	0.63	X	0.7	=	109.6	(74)
North	0.9x	0.77		κ [5.44	X	74	1.72	X	0.63	X	0.7	=	124.22	(74)
North	0.9x	0.77		· [4.8	x	79	9.99	X	0.63	X	0.7	=	117.33	(74)
North	0.9x	0.77		· [5.44	x	79	9.99	x	0.63	X	0.7	=	132.98	(74)
North	0.9x	0.77		· [4.8	x	74	1.68	x	0.63	X	0.7	=	109.55	(74)
North	0.9x	0.77		κ [5.44	x	74	1.68	x	0.63	x	0.7	=	124.15	(74)
North	0.9x	0.77		κ [4.8	x	59	9.25	x	0.63	x	0.7	=	86.91	(74)
North	0.9x	0.77		(5.44	x	59	9.25	x	0.63	x	0.7	=	98.5	(74)
North	0.9x	0.77		κ [4.8	x	4	1.52	x	0.63	x	0.7	=	60.9	(74)
North	0.9x	0.77	,	ΚĪ	5.44	x	4	1.52	x	0.63	x	0.7	=	69.02	(74)
North	0.9x	0.77	;	(4.8	X	24	1.19	Х	0.63	X	0.7	=	35.48	(74)
North	0.9x	0.77		ΚĪ	5.44	x	24	1.19	x	0.63	x	0.7		40.22	(74)
North	0.9x	0.77		κ [4.8	х	1;	3.12	x	0.63	x	0.7	=	19.24	(74)
North	0.9x	0.77		([5.44	x	1;	3.12	x	0.63	x	0.7	=	21.81	(74)
North	0.9x	0.77	,	ΚĪ	4.8	x	8	.86	Х	0.63	x	0.7	=	13	(74)
North	0.9x	0.77	7 ;	ΚĪ	5.44	×	8	.86	X	0.63	x	0.7		14.74	(74)
East	0.9x	0.77		ĸ [1.44	х	19	9.64	X	0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77		、 [1.44	x	38	3.42	x	0.63	x	0.7		16.91	(76)
East	0.9x	0.77	;	κ [1.44	x	63	3.27	x	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77		ĸ [1.44	x	92	2.28	x	0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77		٠ [1.44	x	11	3.09	x	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77		٠ [1.44	x	11	5.77	x	0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77		٠ [1.44	x	11	0.22	x	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	,	ΚĪ	1.44	x	94	1.68	x	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	,	κĪ	1.44	x	7:	3.59	x	0.63	x	0.7	=	32.39	(76)
East	0.9x	0.77	,	٠ [1.44	x	4	5.59	x	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	;	ΚĪ	1.44	x	24	1.49	x	0.63	x	0.7		10.78	(76)
East	0.9x	0.77	;	κİ	1.44	x	10	6.15	x	0.63	x	0.7	<u> </u>	7.11	(76)
				-		-									_
Solar g	ains in	watts, ca	lculate	d 1	for each mon	th_			(83)m	= Sum(74)m .	(82)m			-	
(83)m=	41.92	80.5	135.91		214.19 283.59		01.26	282.2	227	.08 162.31	95.76	51.83	34.85		(83)
Total ga				_	(84)m = (73) n	<u> </u>								7	
(84)m=	418.09	454.73	498.27		557.47 607.69	5 6	506.7	575.48	525	.86 470.85	423.5	7 401.75	401.22		(84)
7. Mea	an interi	nal tempe	erature	e (I	neating seaso	n)									
Tempe	erature	during he	eating	ре	riods in the li	ving	area f	rom Tal	ole 9,	Th1 (°C)				21	(85)
Utilisa <u></u>	tion fac	tor for ga	ins fo	· liv	ving area, h1,	m (s	ee Tal	ole 9a)							
	Jan	Feb	Mar		Apr May	/	Jun	Jul	A	ug Sep	Oct	Nov	Dec]	
0	0 4 D 004	0.1/	40554	رم	AD 0.02\ http://									D	E of 7

Mean internal temperature in the rest of dwelling) = fLA x T1 + (1 - fLA) x T2 x = 1 \															
19.88 20.01 20.23 20.55 20.83 20.96 20.99 20.89 20.85 20.17 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.6	(86)m=	1	1	0.99	0.96	0.87	0.69	0.52	0.59	0.85	0.98	0.99	1		(86)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C)	Mear	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Comp	(87)m=	19.89	20.01	20.23	20.55	20.83	20.96	20.99	20.99	20.89	20.55	20.17	19.87		(87)
Utilisation factor for gains for rest of dwelling, h2/m (see Table 9a) (89)m=	Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89	(88)m=	20.02	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.03		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)					•	
Solid 18.55 18.72 19.05 19.51 19.87 20.03 20.05 20.05 19.95 19.51 18.97 18.53 (9)	(89)m=	1	0.99	0.99	0.95	0.82	0.6	0.41	0.47	0.78	0.96	0.99	1		(89)
Solid 18.55 18.72 19.05 19.51 19.87 20.03 20.05 20.05 19.95 19.51 18.97 18.53 (9)	Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)			•	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m							- ` `	r	i 			18.97	18.53		(90)
(92)me							!	!	!	f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
(92)me	Mear	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) x T2			'		
33 35 35 35 35 35 35 35			· ·	· `	i	i	· · · · ·	i	<u> </u>		19.94	19.46	19.08		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.64 0.46 0.52 0.81 0.96 0.99 1 Useful gains, hmGm, W = (94)m x (84)m (95)m= 416.22 451,26 498.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 Monthly average external tem perature from Table 8 (96)m= 4.3 4.9 6.5 9.9 11.7 44.6 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 - (95)m] x (41)m (97)m= 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWhylear) = Sum(98)s. = 2415.73 (98) Space heating: Fraction of space heat from secondary/supplementary systems including micro-CHP) Space heating: Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating systems including micro-CHP) Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {(198)m x (204)} x 100 ÷ (206) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {(198)m x (204)} x 100 ÷ (206) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52	Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate				
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	(93)m=	19.1	19.25	19.53	19.94	20.26	20.41	20.44	20.43	20.34	19.94	19.46	19.08		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Sp	ace hea	ting requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.64 0.46 0.52 0.81 0.96 0.99 1 Useful gains, hmcm, W = (94)m x (84)m (95)m= 416.22 451.26 499.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = (39)m x [(93)m - (96)m] (97)m= 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98)42 = 2415.73 (98) Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year 93. Energy requirements — Individual heating systems including micro-CHP) Space heating from main system 1 (204) = (202) x [1 - (203)] = 1 (202) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system 1 (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system 1 (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system 1 (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system 1 (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system 2 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204) 3 (204)	tne u			Ţ			lun	lul	Aug	Con	Oct	Nov	Doo		
(94) (94) (94) (94) (94) (95) (94) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (9	l Itilie:		-			IVIAY	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
Useful gains, hmGm. W = (94)m x (84)m (95)m = 416.22 451.26 489.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m - (96)m] (97)m = (1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = (472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Space heating requirement in kWh/m²/year 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06						0.84	0.64	0.46	0.52	0.81	0.96	0.99	1		(94)
(95)me 416.22 451.26 489.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 Monthly average external temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14/6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)me 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98)s = 2415.73 (98) Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of total heating from main system 1 (202) x [1 - (203)] = 1 (202) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 0 180.77 336.52 481.52 (211) m = {[(98)m x (204)]} x 100 ÷ (206) (211)		ıl gains,	hmGm	, W = (9		4)m									
Space heating requirement in kWh/m²/year Space heating requirements - Individual heating systems including micro-CHP Space heating from main system Space heating system Space heating from main system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating system Space heating sy				<u> </u>	<u> </u>		385.54	262.46	273.52	379.46	408.05	398.26	399.77		(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 2415.73 (98)	Mont	hly aver	age exte	rnal tem	perature	from T	able 8							I	
(97)m= 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98)ssv = 2415.73 (98) Space heating requirement in kWh/m²/year Total per year (kWh/year) = Sum(98)ssv = 2415.73 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	(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)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98) _{1.48-12} = 2415.73 (98) Space heating requirement in kWh/m²/year 36.46 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
Space heating requirement in kWh/m²/year Sac.46 (99)	` '		<u> </u>										1046.97		(97)
Space heating requirement in kWh/m²/year Sum(98) _{1.49-12} = 2415.73 (98)				1			i	1	 	i ` i	- `			I	
Space heating requirement in kWh/m²/year 36.46 (99)	(98)m=	472.98	380.33	321.52	176	66.1	0	0					l		(oo)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201)									Tota	ıl per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2415.73	=
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 180.77 336.52 481.52 (211) m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211) (211) (211)	Spac	e heatin	g require	ement in	kWh/m²	²/year								36.46	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211) m = {[(98)m x (204)] } x 100 ÷ (206) (201) 0 (202) 1 (202) 1 (204) 204) 205 807 808 809 809 809 800 800 800	9a. En	ergy red	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211) m = {[(98) m x (204)] } x 100 ÷ (206) 505.86 406.77 343.87 188.24 70.7 0 0 0 0 193.34 359.91 514.99	•		_			, ,									
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 505.86 406.77 343.87 188.24 70.7 0 0 0 0 193.34 359.91 514.99		-					mentary	-		(004)				0	
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 505.86 406.77 343.87 188.24 70.7 0 0 0 0 193.34 359.91 514.99 (208)					•	. ,				, ,				1	
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year				•	•				(204) = (2	02) x [1 – ((203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 505.86 406.77 343.87 188.24 70.7 0 0 0 193.34 359.91 514.99	Effici	ency of ı	main spa	ace heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above)	Effici	ency of	seconda	ry/suppl	ementar	y heatin	g system	າ, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	/ear
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ 505.86 $	Spac			- `		d above)							1	
505.86 406.77 343.87 188.24 70.7 0 0 0 193.34 359.91 514.99		472.98	380.33	321.52	176	66.1	0	0	0	0	180.77	336.52	481.52		
	(211)n	n = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)								•	(211)
Total (kWh/year) =Sum(211) _{15,1012} = 2583.67 (211)		505.86	406.77	343.87	188.24	70.7	0	0		_					
									Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2583.67	(211)

Space heating fuel (secondary), kWh/month									
$= \{[(98)m \times (201)]\} \times 100 \div (208)$									
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		
		-	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	_	0	(215)
Water heating									
Output from water heater (calculated above) 185.75 163.79 172.18 154.58 151.65 163.79 172.18 154.58 151.65 163.79 172.18 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154	135.75	130.6	143	142.64	160.28	169.19	181.36		
Efficiency of water heater	135.75	130.6	143	142.04	100.20	169.19	101.30	70.0	(216)
(217)m= 87.2 86.99 86.46 85.16 82.77	79.8	79.8	79.8	79.8	85.14	86.61	87.3	79.8	(217)
Fuel for water heating, kWh/month	70.0	7 0.0	70.0	70.0	00.14	00.01	07.0		(=,
(219) m = (64) m x $100 \div (217)$ m								ı	
(219)m= 213.01 188.29 199.16 181.52 183.22	170.11	163.66	179.19	178.75	188.27	195.34	207.75		_
			Tota	I = Sum(2				2248.27	(219)
Annual totals Space heating fuel used, main system 1					k\	Wh/year	•	kWh/year	7
								2583.67	╣
Water heating fuel used								2248.27	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(2 30g) =			75	(231)
Electricity for lighting								303.98	(232)
Total delivered energy for all uses (211)(221) +	- (231) -	+ (232).	(237b)	=				5210.92	(338)
12a. CO2 emissions – Individual heating system	ns inclu	ding mid	cro-CHP		_				
		ergy			Emiss	ion fac	tor	Emissions	
	kWl	h/year			kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(211)) x			0.2	16	=	558.07	(261)
Space heating (secondary)	(215)) x			0.5	19	=	0	(263)
Water heating	(219)) x			0.2	16	=	485.63	(264)
Space and water heating	(261)) + (262) -	+ (263) + (264) =				1043.7	(265)
Electricity for pumps, fans and electric keep-hot	(231)) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232)) x			0.5	19	=	157.76	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1240.39	(272)
							ı		_

TER =

(273)

18.72

SAP Input

Property Details: Sample 2 (Bottom)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height:

Floor 0 66.25 m^2 3 m

Living area: 27.2 m² (fraction 0.411)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	F <mark>rame</mark> :
DOO	R	<u>Manuf</u> actur <mark>e</mark> r	Solid			W <mark>ood</mark>
W		Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
N		Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
Balco	ony	Manufactur <mark>e</mark> r	Windows	low-E, En = 0.05, soft coat	No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
N		0.7	0.4	1	10.24	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
N		N	North	0	0
Balcony		N	North	0	0

Overshading: More than average

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elem	<u>nents</u>						
N	31.8	15.04	16.76	0.15	0	False	N/A
W	18.75	1.44	17.31	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	66.25			0.11			N/A

Internal Elements
Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			P	roperty.	Address	: Sample	e 2 (Bott	om)			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (2\		Av. Ha	: a.b.4/\		Value a/m²	21
Ground floor					a(m²) 66.25	(1a) x		ight(m)	(2a) =	Volume(m ²	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)	+(1d)+(1e	e)+(1ı	ገ) 6	6.25	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	198.75	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdar neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ı r (6a)
Number of open flues		╡ + ト	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa		L		J L		_			10 =		(7a)
						Ļ	0		10 =	0	╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flues and	I fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has t			ed, procee	d to (17), (otherwise (continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	he dw <mark>elling</mark> (ns)						[(0)	11,0 1	0	(9)
Structural infiltration: 0	25 for steel	or timber	frame o	. 0. 35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	dottori			0	(''')
deducting areas of openi											_
If suspended wooden		•	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en Percentage of window			tripped							0	(13)
Window infiltration	3 and doors	draught 3	пррец		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(14)
Infiltration rate					(8) + (10)	+ (11) + (1	- 12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expres	sed in cub	oic metre	s per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabi				•	•	•		·		0.15	(18)
Air permeability value applie	es if a pressuris	ation test ha	s been doi	ne or a deg	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed				(00) 4	[0 07F /4	10)1			2	(19)
Shelter factor					` '	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	•		J		(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified			1	11	۸	800	Oct	Mov	Doo]	
Jan Feb	Mar Apr		Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
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]	
()	7.4	1 7.5	L 3.5	L 3.5	L 3.7	<u> </u>	I 7.5	L 7.5	L'	J	
Wind Factor (22a)m = $(2$	2)m ÷ 4									_	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

· —	ation rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.16 Calculate effec	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
If mechanica		•	ale ioi i	пе аррп	cable ca	36						0.5	(23
If exhaust air he	at pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat recov	very: effici	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mecha	nical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mecha	nical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole he if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v				•					0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change i	rate - en	iter (24a	or (24k	o) or (24	c) or (24	d) in box	x (25)	-	-	-		
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	at loss r	paramete	er:							_		
ELEMENT	Gros	s	Openin		Net Ar		U-val		AXU		k-value		ΑΧk
	are <mark>a</mark> ((m²)	m	2	A ,r	n²	W/m2	2K	(W/I	<) 	kJ/m²-	K	kJ/K
Doors					2.4	Х	1.4	=	3.36	닠			(26
Vin <mark>dows</mark> Type					1.44		1/[1/(1)+		1.38	닡			(27
Vin <mark>dows Type</mark>					10.24		1/[1/(1)+		9.85	닉			(27
Vindows Type 	3				4.8	X	1/[1/(1)+	0.04] =	4.62	닠 ,			(27
loor					66.25	x	0.11	= !	7.2875	닠 !		⊣	(28
Valls Type1	31.8		15.0	4	16.76	<u> </u>	0.15	=	2.51	<u> </u>		⊣	(29
Valls Type2	18.75	5	1.44	_	17.3	X	0.15	=	2.6	<u> </u>		⊣	(29
Valls Type3	11.1		2.4		8.7	X	0.15	=	1.3	ᆜ ᆝ		⊣	(29
Valls Type4	2.4		0		2.4	X	0.35	=	0.84				(29
otal area of el	·				130.3								(3
for windows and * include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	1 3.2	
abric heat los							(26)(30)) + (32) =				33.75	(3:
leat capacity (Cm = S(/	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5601.13	(34
hermal mass	paramet	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(3
or design assess an be used instea				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	s : S (L :	x Y) cal	culated i	using Ap	pendix l	<						19.55	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)				(0.0)				<u> </u>
	at loss							(33) +	(36) =			53.29	(3
otal fabric hea entilation hea		ا اداما							= 0.33 × (05) (5)		33.29	(3

(00) 47.50	17.00	17.44	40.07	45.00	44.04	44.04	44.04	45.00	45.00	40.00	107		(20)
(38)m= 17.53	17.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7		(38)
Heat transfer (39)m= 70.82	70.61	nt, W/K 70.41	69.36	69.15	68.11	68.11	67.9	(39)m 68.52	= (37) + (3 69.15	38)m 69.57	69.99		
(39)111= 70.62	70.01	70.41	09.30	09.13	00.11	00.11	07.9		Average =		l	69.31	(39)
Heat loss para	meter (l	HLP), W	m²K						= (39)m ÷		12 / 12-		(==)
(40)m= 1.07	1.07	1.06	1.05	1.04	1.03	1.03	1.02	1.03	1.04	1.05	1.06		_
Number of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occu	inanav	NI											(40)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		.15		(42)
Annual averag	je hot wa										5.3		(43)
Reduce the annua							to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								Эер	Oct	1404	Dec		
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
									Γotal = Su	· '	L	1023.65	(44)
Energy content of		used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
If instantaneous w	vater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)		Γotal = Su	m(45) ₁₁₂ =	= [1342.17	(45)
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage		!	l		l	l .	l						
Storage volum	` '		•			•		ame ves	sel		0		(47)
If community h Otherwise if no	_			•			' '	ers) ente	ar '∩' in <i>(</i>	<i>4</i> 7)			
Water storage		not wate) (till) ii	ioidaes i	iistaiitai	10003 00	TIDI DON	craj crito	, 0 111 (- 11)			
a) If manufact	urer's d	eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)) =		1	10		(50)
b) If manufactHot water store			-							0	.02		(51)
If community h	•			0 2 (1.77)	11/11(10)(40	· y /				0.	.02		(01)
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or	. , .	•	, ,	.1			((==) (1.	.03		(55)
Water storage					i .		((56)m = (i			
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	v Ll	(56)
If cylinder contains		r	1		ı	1				1		Λ 1 Π	/ >
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 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 0 0 0 0 0
(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 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)m= 0 0 0 0 0 0 0 0 0 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
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(62)m= 194.43 171.63 180.87 162.99 160.34 144.15 139.29 151.68 151.05 168.96 177.59 190.04 (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)
(62)m= 194.43 171.63 180.87 162.99 160.34 144.15 139.29 151.68 151.05 168.96 177.59 190.04 (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)
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)
FHRS 17.95 15.96 16.41 14.51 13.96 12.12 11.22 12.87 13.02 15.02 16.24 17.46 (63) (G2
Output from water heater
(64)m= 173.8 153.25 161.77 145.88 143.69 129.44 125.38 136.13 135.43 151.27 158.76 169.9
Output from water heater (annual) ₁₁₂ 1784.71 (64)
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 x [(46)m + (57)m + (59)m]
(65)m= 90.49 80.41 85.98 79.2 79.15 72.94 72.15 76.27 75.23 82.02 84.06 89.03 (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
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 107.59 107.59 107.59 107.59 107.59 107.59 107.59 107.59 107.59 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
(67)m= 16.81 14.93 12.14 9.19 6.87 5.8 6.27 8.15 10.93 13.88 16.2 17.27 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 188.39 190.35 185.42 174.93 161.69 149.25 140.94 138.98 143.91 154.4 167.64 180.08 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m= 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 (69)
Pumps and fans gains (Table 5a)
(70)m =
Losses e.g. evaporation (negative values) (Table 5)
(71)m= -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 (71)
Water heating gains (Table 5)
(72)m= 121.63 119.66 115.56 110 106.39 101.3 96.98 102.52 104.49 110.25 116.75 119.66 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
(73)m= 382.1 380.21 368.4 349.4 330.23 311.63 299.46 304.93 314.61 333.8 355.86 372.29 (73)
6. Solar gains:
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)
North 0.9x 0.77 x 10.24 x 10.63 x 0.4 x 0.7 = 21.13 (74)

North	0.9x	0.77	X	4.8	X	10	0.63	X	0.4	X	0.7	=	9.9	(74)
North	0.9x	0.77	×	10.24	x	20	0.32	x	0.4	x	0.7	=	40.38	(74)
North	0.9x	0.77	x	4.8	x	20	0.32	x	0.4	x	0.7	=	18.93	(74)
North	0.9x	0.77	X	10.24	x	34	4.53	x	0.4	x	0.7	=	68.61	(74)
North	0.9x	0.77	X	4.8	x	34	4.53	x	0.4	х	0.7	=	32.16	(74)
North	0.9x	0.77	X	10.24	x	5	5.46	x	0.4	х	0.7	=	110.21	(74)
North	0.9x	0.77	X	4.8	x	5	5.46	x	0.4	x	0.7	=	51.66	(74)
North	0.9x	0.77	X	10.24	x	7-	1.72	x	0.4	х	0.7	=	148.46	(74)
North	0.9x	0.77	X	4.8	x	7-	1.72	x	0.4	х	0.7	=	69.59	(74)
North	0.9x	0.77	X	10.24	x	79	9.99	x	0.4	x	0.7	=	158.93	(74)
North	0.9x	0.77	X	4.8	x	79	9.99	x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	10.24	x	7-	4.68	x	0.4	х	0.7	=	148.38	(74)
North	0.9x	0.77	X	4.8	x	7-	4.68	x	0.4	x	0.7		69.55	(74)
North	0.9x	0.77	×	10.24	x	5	9.25	x	0.4	x	0.7	=	117.72	(74)
North	0.9x	0.77	x	4.8	x	5	9.25	x	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	x	10.24	x	4	1.52	х	0.4	x	0.7	=	82.49	(74)
North	0.9x	0.77	X	4.8	x	4	1.52	х	0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	X	10.24	X	24	4.19	Х	0.4	Х	0.7	=	48.06	(74)
North	0.9x	0.77	= x	4.8	j x	24	4.19	х	0.4	x	0.7	= -	22.53	(74)
North	0.9x	0.77	×	10.24	х	1:	3.12	×	0.4	х	0.7	=	26.06	(74)
North	0.9x	0.77	j x	4.8	x	1:	3.12	x	0.4	х	0.7	=	12.22	(74)
North	0.9x	0.77	j ×	10.24	x	8	.86	Х	0.4	x	0.7	=	17.61	(74)
North	0.9x	0.77	X	4.8	j x	8	.86	Х	0.4	х	0.7	=	8.26	(74)
West	0.9x	0.77	i x	1.44	x	1	9.64	x	0.4	х	0.7	=	5.49	(80)
West	0.9x	0.77	i x	1.44	X	3	3.42	x	0.4	_ ×	0.7		10.74	(80)
West	0.9x	0.77	×	1.44	x	6:	3.27	x	0.4	x	0.7	=	17.68	(80)
West	0.9x	0.77	X	1.44	x	9:	2.28	х	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	X	1.44	j×	11	3.09	x	0.4	×	0.7	=	31.6	(80)
West	0.9x	0.77	X	1.44	x	11	5.77	х	0.4	x	0.7	=	32.35	(80)
West	0.9x	0.77	X	1.44	X	11	0.22	x	0.4	x	0.7	=	30.8	(80)
West	0.9x	0.77	X	1.44	j x	94	4.68	x	0.4	×	0.7	=	26.45	(80)
West	0.9x	0.77	×	1.44	x	7:	3.59	x	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	×	1.44	x	4:	5.59	x	0.4	x	0.7		12.74	(80)
West	0.9x	0.77	×	1.44	x	24	1.49	x	0.4	x	0.7	-	6.84	(80)
West	0.9x	0.77	×	1.44	X	10	6.15	x	0.4	×	0.7	=	4.51	(80)
	_				_									
Solar g	ains in v	watts, calcu	lated	for each mon	ıth			(83)m	ı = Sum(74)m	(82)m				
(83)m=	36.52	70.04 11	8.45	187.65 249.6	5 2	65.77	248.73	199	.36 141.72	83.33	45.12	30.38		(83)
Total ga	ains — ir	nternal and	solar	(84)m = (73) r	n + (83)m ,	watts						•	
(84)m=	418.62	450.25 48	6.85	537.05 579.8	8 5	77.41	548.19	504	.28 456.33	417.14	400.99	402.68		(84)
7. Mea	an interr	nal tempera	iture (heating seas	on)									
Tempe	erature	during heat	ing pe	eriods in the I	iving	area f	rom Tal	ble 9,	Th1 (°C)				21	(85)
Utilisa	tion fact	tor for gains	s for li	ving area, h1	<u>,m (</u> s	ee Tal	ole 9a)							_
	Jan	Feb I	Mar	Apr Ma	у	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
Stroma F	SAP 2011	2 Version: 1.0	5 51 (9	SAP 9 92) - http:/	/\a\\a\\	etroma	com —						Page	5 of 7

(86)m= 1	1	0.99	0.97	0.88	0.71	0.54	0.6	0.86	0.98	0.99	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m= 19.9	20.01	20.22	20.54	20.81	20.96	20.99	20.99	20.88	20.55	20.18	19.88		(87)
Temperature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m= 20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04		(88)
Utilisation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)	-	-	-	-		
(89)m= 1	0.99	0.99	0.95	0.84	0.62	0.43	0.49	0.79	0.97	0.99	1		(89)
Mean interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)			'	
(90)m= 18.56	18.72	19.03	19.49	19.86	20.03	20.06	20.06	19.96	19.52	18.98	18.54		(90)
								f	LA = Livin	g area ÷ (4) =	0.41	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	llina) = f	I A × T1	+ (1 – fl	A) x T2			· ·		
(92)m= 19.11	19.25	19.52	19.92	20.25	20.41	20.44	20.44	20.34	19.94	19.47	19.09		(92)
Apply adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	ļ			
(93)m= 19.11	19.25	19.52	19.92	20.25	20.41	20.44	20.44	20.34	19.94	19.47	19.09		(93)
8. Space hea	ting requ	uirement											
Set Ti to the r					ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation Jan	Feb	or gains Mar		May	lup	Jul	Aug	Con	Oct	Nov	Dec		
Utilisation fac	-		Apr	IVIAY	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m= 1	0.99	0.98	0.95	0.85	0.66	0.47	0.54	0.82	0.97	0.99	1		(94)
Useful gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m= 416.74	446.95	479.02	510.77	494.47	378.91	259.27	269.81	372.68	402.55	397.52	401.2		(95)
Monthly avera	age exte	rnal tem	perature	from T	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	1			r	1	-`` / 	- ` 	<u> </u>	ī			I	(07)
(97)m= 1048.81			764.42	591.28	395.99	261.62	274.24	427.48	645.97	860.75	1042.39		(97)
Space heatin (98)m= 470.26	g require 380.56	325.77	182.63	72.03	vvn/mon	$\ln = 0.02$	24 X [(97])m – (95 0	181.11	333.52	477.05		
(50)1112	000.00	020.77	102.00	12.00				l per year				2422.93	(98)
Space heatin	a roquir	omont in	k\A/b/m3	2/voor			7010	ii poi youi	(KVVIII) your) = Cum(o	0/15,912		(99)
Space heatin	• .			•								36.57	(99)
9b. Energy red													
This part is use Fraction of spa			• .		•		• .	•		unity scr	neme.	0	(301)
Fraction of spa			•		•	_	`	,				1	(302)
•			•	•	,	,	allows for	CUD and	un to four	othar haat	oouroos: t		(002)
The community so includes boilers, h									ир то тоит с	olner neat	Sources, u	ne iallei	
Fraction of hea	at from C	Commun	ity boile	rs								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	l (Table	4c(3)) fo	r commı	unity hea	ating svs	tem			1	(305)
Distribution los				,	,		•	3 - 7 -					(306)
		(I able I	120) 101 (Jonniluli	ity Heath	ig sysie	111					1.05	``
Space heating Annual space	-	requirem	nent									kWh/ye 2422.93	ar
, unidai space	. routing	. oquilett	.orit									2422.33	

Space heat from Community boilers		(98) x (304a) x	(305) x (306) =	2544.07	(307a)
Efficiency of secondary/supplementary h	neating system in % (fro			0](308
Space heating requirement from second			,	0	(309)
,	ary/supplementary syste	(00) x (001) x (. (000) =	<u> </u>](000)
Water heating Annual water heating requirement				1784.71	1
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	1873.94	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	7e) + (310a)(310e)] =	44.18	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	= (107) ÷ (314)) =	0	(315)	
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extra		outside	'	118.21	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	(b) + (330g) =	118.21	(331)
Energy for lighting (calculated in Append	dix L)			296.83	(332)
Total delivered energy for all uses (307)	+ (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	4833.05	(338)
12b. CO2 Emissions – Community heati		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)	ater heating (not CHP)		kg CO2/kWh	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and w	ater heating (not CHP) If there is CHP using	kWh/year	kg CO2/kWh	kg CO2/year](367a)](367)
CO2 from other sources of space and w Efficiency of heat source 1 (%)	ater heating (not CHP) If there is CHP using [(307b)+(kWh/year g two fuels repeat (363) to	kg CO2/kWh (366) for the second fuel	kg CO2/year	J
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1	ater heating (not CHP) If there is CHP using [(307b)+(kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x	(366) for the second fuel 0.22 = 0.52 =	95 1004.52	(367)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	ater heating (not CHP) If there is CHP using [(307b)+(kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x	(366) for the second fuel 0.22 = 0.52 =	95 1004.52 22.93	(367)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	ater heating (not CHP) If there is CHP using [(307b)+(kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(373) (309) x	(366) for the second fuel 0.22 = 0.52 = 0.52 =	95 1004.52 22.93 1027.45	(367) (372) (373)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (sec	ater heating (not CHP) If there is CHP using [(307b)+(ystems condary) ion heater or instantane	kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(373) (309) x	(366) for the second fuel 0.22 = 0.52 = 0 =	95 1004.52 22.93 1027.45](367)](372)](373)](374)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immers)	ater heating (not CHP) If there is CHP using [(307b)+(ystems condary) ion heater or instantane ater heating	kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x ((313) x ((363)(366) + (368)(373) (309) x (309) x (309) x (303) + (374) + (375) =	(366) for the second fuel 0.22 = 0.52 = 0 =	95 1004.52 22.93 1027.45 0](367)](372)](373)](374)](375)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immersor Total CO2 associated with space and we compared to the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of t	rater heating (not CHP) If there is CHP using [(307b)+(ystems condary) dion heater or instantane eater heating os and fans within dwelling os and fans within dwelling	kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x ((313) x ((363)(366) + (368)(373) (309) x (309) x (309) x (303) + (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0.52 = 0 = 0.22 =	95 1004.52 22.93 1027.45 0 1027.45](367)](372)](373)](374)](375)](376)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immersor Total CO2 associated with space and we CO2 associated with electricity for pump	rater heating (not CHP) If there is CHP using [(307b)+(ystems condary) dion heater or instantane eater heating os and fans within dwelling os and fans within dwelling	kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(373) (309) x (373) + (374) + (375) = ng (331)) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 =	95 1004.52 22.93 1027.45 0 1027.45 61.35](367)](372)](373)](374)](375)](376)](378)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immersor Total CO2 associated with space and we CO2 associated with electricity for pump CO2 associated with electricity for lighting	rater heating (not CHP) If there is CHP using [(307b)+(ystems condary) ition heater or instantane ater heating os and fans within dwelling ()	kWh/year g two fuels repeat (363) to (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(373) (309) x (373) + (374) + (375) = ng (331)) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 =	95 1004.52 22.93 1027.45 0 1027.45 61.35 154.05](367)](372)](373)](374)](375)](376)](378)](379)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	112		Strom				Versio	on: 1.0.5.51	
			roperty	Address			tom)			
Address :						()	,			
1. Overall dwelling dimer	nsions:									
Ground floor			_	a(m²) 66.25	(1a) x	Av. He	eight(m)	(2a) =	Volume(m) 198.75	³)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 6	66.25	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	198.75	(5)
2. Ventilation rate:										
Number of chimneys	heating	secondar heating	у П + Г	other	7 = [total	x	40 =	m³ per hou	ır (6a
•		0	」	0]	0		20 =	0	=
Number of open flues		0	J Ť L	0] - [0			0	(6b
Number of intermittent fan	S				Ĺ	2		10 =	20	(7a
Number of passive vents		_			L	0	X	10 =	0	(7b
Number of flueless gas fire	es					0	X	40 =	0	(7c
								Air ch	nanges <mark>per</mark> he	our
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7	′a)+(7b)+((7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has be	en ca <mark>rried o</mark> ut or is inten	ded, procee	d to (17),	otherwise (continue f	rom (9) to				``
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration			2.25 ([(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2 if both types of wall are pre					•	ruction			0	(11
deducting areas of opening		osponding to	The great	ior wan arc	a (antor					
If suspended wooden flo	oor, enter 0.2 (unse	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente									0	(13
Percentage of windows	and doors draught	stripped		0.05 (0.0		4001			0	(14
Window infiltration				0.25 - [0.2	. ,	-	. (4E)		0	(15
Infiltration rate	FO everenced in a	ibia matra	a nar h	(8) + (10)				oroo	0	(16
Air permeability value, out of the Air permeability value, or air permeability and the Air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeabilit	•		•	•	•	ietre or e	envelope	area	5	(17
Air permeability value applies	-					is being u	ısed		0.35	(18
Number of sides sheltered			·		·	ŭ			2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.3	(21
Infiltration rate modified fo	r monthly wind spee	ed							,	
Jan Feb M	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
, ,						1			J	

Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	T	I	1	ı	
0.38 Calculate effe	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
If mechanica		•	iale ioi l	пе аррп	Cable Ca	SE						0	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	n heat reco	very: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100]	`
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)	•	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse ext			•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation								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		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	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. Heat losse	s and he	at loss r	paramet	jr.					_			_	
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>					2.4	Х	1	=	2.4				(20
Vindows Type	1				1.24	x1.	/[1/(1.4)+	0.04] =	1.64				(27
Vindows Type	2				8.8	x1.	/[1/(1.4)+	0.04] =	11.67				(2
Vindows Type	3				4.12	х1	/[1/(1.4)+	0.04] =	5.46				(2
loor					66.25	5 X	0.13	=	8.61249	9			(2
Valls Type1	31.8	3	12.9	2	18.88	3 X	0.18	= [3.4	\Box [(2
Valls Type2	18.7	5	1.24		17.5′	X	0.18	=	3.15				(29
Valls Type3	11.1		2.4		8.7	Х	0.18	=	1.57				(29
Valls Type4	2.4		0		2.4	х	0.18	<u> </u>	0.43	$\overline{}$		$\overline{}$	(29
otal area of e	lements,	, m²			130.3	3							(3:
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions		(00) (00)) . (22)				T	
abric heat los		,	U)				(26)(30)		(00) (0)	a) (00)	(00.)	38.33	==
leat capacity	•	,	O	TEA):	- I- I/21/			., ,	(30) + (32	, , ,	(32e) =	5633.6	
hermal mass	•	,		,			raciaaly the		tive Value		abla 1f	250	(3:
or design assess an be used inste				CONSTRUCT	ion ale 110	k KITOWIT PI	ธ บเจ ษ เฎ เกิด	= IIIUICALIVE	vaiues Of	TIVIT III I	abic II		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						6.52	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)								
otal fabric he								(33) +	(36) =			44.85	(3
entilation hea		lculated	monthly	/	•				= 0.33 × (25)m x (5)) I	I	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Heat transfer coefficient, W/K (39)m = 82.38 82.19 82.01 81.17 81.01 80.27 80.27 80.13 80.56 81.01 81.33 81.66 Average = Sum(39) ₁₁₂ /12= 81.17 (39) Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) (40)m = (39)m ÷ (4) Average = Sum(40) ₁₁₂ /12= 1.23 (40) Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		i	i	i			i	ı			·	i	1	
Casima	(38)m= 37.53	37.35	37.16	36.32	36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38)
Heat loss parameter (HLP), Wim³K (40)me 124 124 124 123 122 121 121 121 121 122 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123									` ′				1	
Heat loss parameter (HLP), W/m²K (40)m= 1.24	(39)m= 82.38	82.19	82.01	81.17	81.01	80.27	80.27	80.13				<u> </u>	04.47	7(20)
Average = Sum(40)/12= 1.23 (40)		meter (H	HLP), W/	/m²K			Г	1		_		12 /12=	81.17	(39)
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(40)m= 1.24	1.24	1.24	1.23	1.22	1.21	1.21	1.21						¬
A. Water heating energy requirement. Assumed occupancy, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N As	Number of day	rs in moi	nth (Tah	le 1a)					,	Average =	Sum(40)₁	12 /12=	1.23	(40)
4. Water heating energy requirement: Assumed occupancy, N		i	`		Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) If TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = loctor from Table 1 x (49) (44)m = 33.83 90.42 87.01 83.6 80.19 76.77 76.77 80.19 83.6 87.01 90.42 93.83 Total = Sumid+4) = 1023.85 (44) Energy content of hot water used anothly - 4,190 x Vd.m x mm x DTm / 3800 kWh/month (see Tables 1b. c. 1d) (46)m = 133.3.5 121.71 125.59 105.49 105.06 90.66 84.07 96.4 97.65 113.69 124.1 134.76 Total = Sum(45) = 1342.17 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 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: 3) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b 0 0 05.54 Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 0 0.75 (55) Water storage loss calculated for each month ((56)m = (55) x (41)m (55)) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m = (55) x (41)m (56)m = (56) x (57)m = (56)m x (50) - (1411) + (50), else (57)m = (56)m where (4111) is from Appendix H								— <u> </u>				1		(41)
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Reduce the annual average hot water usage by 5% if the divelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			+ 1.70 X	II - exp	(-0.0003	49 X (11	A -13.8	<i>)</i> ∠)] + 0.() X C I U	IFA -13.	.9)			
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Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		•		• •		-	-	to achieve	a water us	se target o	f		•	
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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= 139.15	(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19					4000.05	7(44)
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### ### ##############################	(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
(46)m= 20.87 18.26 18.84 16.42 15.76 13.6 12.6 14.46 14.63 17.05 18.61 20.21 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (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): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b 0 (51) Gold the colspan="8">Gold the cols	_									Γotal = Su	m(45) ₁₁₂ =	_	1342.17	(45)
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Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)	(-/	l	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
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(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	••		-						·		-			
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m			•	
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)		s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ı lix H	
	(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) from	Гable 3							0		(58)
Primary circuit loss calculated for e		59)m = (5	58) ÷ 36	55 × (41)	m					
(modified by factor from Table H	5 if there is s	olar wate	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01 23.26 22	2.51 23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each mo	onth (61)m =	(60) ÷ 36!	5 × (41)	ım		•	•			
	0 0	0	0	0	0	0	0	0		(61)
Total heat required for water heati	ng calculated	for each	month	(62)m =	0.85 x (/45)m +	(46)m +	(57)m +	(59)m + (61)m	
	4.58 151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		(62)
Solar DHW input calculated using Appendi						<u> </u>	l .			
(add additional lines if FGHRS and								3,		
·	0 0	0	0	0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0	0	0	0	0	0		(63) (G2
Output from water heater										
·	4.58 151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		
, ,	 	<u> </u>		Outp	out from wa	L ater heate	<u>l</u> r (annual)₁	12	1890.79	(64)
Heat gains from water heating, kW	/h/month 0 2!	5 ´ [0 85 x	x (45)m	+ (61)m	n1 + 0 8 x	([(46)m	+ (57)m	+ (59)m	1	_
	2.48 72.21	66.22	65.21	69.33	68.51	75.08	77.34	82.08	J	(65)
include (57)m in calculation of (6									eating	
1 1	1 1	yiiildei is	III tilo c	Aweiling	Of flot w	ater is ii	OIII COIII	indinity in	calling	
5. Internal gains (see Table 5 an	d Sa).					-			_	
Metabolic gains (Table 5), Watts	\nr \May	lun	Jul		Con	Oct	Nov	Doo		
	Apr May 7.59 107.59	Jun 107.59	107.59	Aug 107.59	Sep 107.59	Oct 107.59	Nov 107.59	Dec 107.59		(66)
						107.59	107.59	107.39		(00)
Lighting gains (calculated in Appe	-					40.0	40.00	47.00		(67)
` '	6.88	5.81	6.27	8.15	10.94	13.9	16.22	17.29		(07)
Appliances gains (calculated in Ap	 									(00)
` '	4.93 161.69		140.94	138.98	143.91	154.4	167.64	180.08		(68)
Cooking gains (calculated in Appe			 				1			(22)
(69)m= 33.76 33.76 33.76 33	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76		(69)
Pumps and fans gains (Table 5a)						T	T	.		
(70)m= 3 3 3	3 3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporation (negative	values) (Tab	le 5)								
(71)m= -86.07 -86.07 -86.07 -8	6.07 -86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07		(71)
Water heating gains (Table 5)										
(72)m= 112.29 110.32 106.23 10	0.67 97.05	91.97	87.65	93.18	95.15	100.91	107.41	110.33		(72)
Total internal gains =		(66)m	n + (67)m	+ (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m= 375.78 373.89 362.08 34	3.07 323.9	305.3	293.13	298.6	308.28	327.48	349.54	365.97		(73)
6. Solar gains:										
Solar gains are calculated using solar flux	from Table 6a	and associa	ited equa	tions to co	nvert to th	e applicab	le orientat	ion.		
	Area	Flux		_	g_ 	-	FF		Gains	
Table 6d	m²	ı abl	le 6a	. <u></u>	able 6b		able 6c		(W)	_
North 0.9x 0.77 x	8.8	x 10).63	X	0.63	×	0.7	=	28.6	(74)

	_					-		_						
North	0.9x	0.77		X	4.12	X	10.63	X	0.63	X	0.7	=	13.39	(74)
North	0.9x	0.77		X	8.8	X	20.32	X	0.63	x	0.7	=	54.65	(74)
North	0.9x	0.77		x	4.12	X	20.32	X	0.63	x	0.7	=	25.59	(74)
North	0.9x	0.77		x	8.8	X	34.53	x	0.63	x	0.7		92.87	(74)
North	0.9x	0.77		x	4.12	X	34.53	X	0.63	x	0.7	=	43.48	(74)
North	0.9x	0.77		x	8.8	X	55.46	X	0.63	x	0.7	=	149.17	(74)
North	0.9x	0.77		x	4.12	X	55.46	X	0.63	x	0.7	=	69.84	(74)
North	0.9x	0.77		x	8.8	X	74.72	X	0.63	x	0.7	=	200.94	(74)
North	0.9x	0.77		x	4.12	X	74.72	X	0.63	x	0.7	=	94.08	(74)
North	0.9x	0.77		x	8.8	X	79.99	X	0.63	x	0.7		215.11	(74)
North	0.9x	0.77		x	4.12	X	79.99	X	0.63	x	0.7	=	100.71	(74)
North	0.9x	0.77		x	8.8	X	74.68	X	0.63	x	0.7	=	200.83	(74)
North	0.9x	0.77		x	4.12	X	74.68	X	0.63	x	0.7	=	94.03	(74)
North	0.9x	0.77		x	8.8	X	59.25	X	0.63	x	0.7	=	159.34	(74)
North	0.9x	0.77		x	4.12	X	59.25	X	0.63	x	0.7	=	74.6	(74)
North	0.9x	0.77		x	8.8	X	41.52	X	0.63	x	0.7	=	111.65	(74)
North	0.9x	0.77		x	4.12	X	41.52	x	0.63	x	0.7	=	52.27	(74)
North	0.9x	0.77		x	8.8	X	24.19	Х	0.63	Х	0.7	=	65.05	(74)
North	0.9x	0.77		x	4.12	х	24.19	х	0.63	х	0.7	=	30.46	(74)
North	0.9x	0.77		x	8.8	х	13.12	x	0.63	х	0.7	=	35.28	(74)
North	0.9x	0.77		x	4.12	x	13.12	x	0.63	х	0.7	=	16.52	(74)
North	0.9x	0.77		x	8.8	X	8.86	Х	0.63	x	0.7	=	23.84	(74)
North	0.9x	0.77		x	4.12	x	8.86	х	0.63	х	0.7		11.16	(74)
West	0.9x	0.77		x	1.24	х	19.64	x	0.63	x	0.7	=	7.44	(80)
West	0.9x	0.77		x	1.24	x	38.42	x	0.63	x	0.7	_	14.56	(80)
West	0.9x	0.77		x	1.24	X	63.27	X	0.63	x	0.7	=	23.98	(80)
West	0.9x	0.77		x	1.24	X	92.28	x	0.63	x	0.7	=	34.97	(80)
West	0.9x	0.77		x	1.24	X	113.09	x	0.63	x	0.7	=	42.86	(80)
West	0.9x	0.77		x	1.24	X	115.77	x	0.63	x	0.7	=	43.87	(80)
West	0.9x	0.77		x	1.24	X	110.22	x	0.63	x	0.7	=	41.77	(80)
West	0.9x	0.77		x	1.24	X	94.68	X	0.63	x	0.7	=	35.88	(80)
West	0.9x	0.77		x	1.24	X	73.59	X	0.63	x	0.7	=	27.89	(80)
West	0.9x	0.77		x	1.24	X	45.59	x	0.63	x	0.7	=	17.28	(80)
West	0.9x	0.77		x	1.24	x	24.49	x	0.63	×	0.7		9.28	(80)
West	0.9x	0.77		x	1.24	x	16.15	x	0.63	×	0.7		6.12	(80)
	_													_
Solar g	ains in	watts, ca	alcula	ated	for each mon	th		(83)m	n = Sum(74)m .	(82)m			•	
(83)m=														
Ī					(84)m = (73) r					-		1	I	
(84)m=	425.21	468.68	522	.4	597.05 661.7	8	665 629.77	568	.41 500.1	440.27	410.62	407.1		(84)
7. Mea	an inter	nal temp	eratu	ıre (heating seaso	on)								
Temp	erature	during h	eatin	ıg pe	eriods in the li	ving	area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains f	for li	ving area, h1	,m (s	ee Table 9a)						 I	
	Jan	Feb	Ma	ar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
04	-O A D 004	10 \/ '	405	F4 /C	:AD 0 02\ http:/	<i>t</i>	-1						D	5 of 7

Mean internal temperature in the rest of dwelling) = fLA x T1 + (1-fLA) x T2 18.75 18.85 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75															
(87) (87) (87) (87) (88) (88) (87) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) (88) ((86)m=	1	1	0.99	0.96	0.88	0.71	0.55	0.62	0.87	0.98	0.99	1		(86)
Comparison 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	' in Table	e 9c)					
Base 19.89 19.89 19.89 19.89 19.89 19.91 19.91 19.91 19.91 19.91 19.91 19.93 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89 19.89	(87)m=	19.67	19.81	20.06	20.43	20.76	20.94	20.99	20.98	20.83	20.42	19.99	19.65		(87)
Utilisation factor for gains for rest of dwelling, h.2,m (see Table 9a) (89)m	Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m= 1.8.13 18.82 18.7 19.23 19.66 19.87 19.91 19.91 19.77 19.23 18.6 18.1 (90) (18.73 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92) (92)m= 18.76 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92) (93)m= 18.76 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93)m= 18.76 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18	(88)m=	19.89	19.89	19.89	19.9	19.9	19.91	19.91	19.91	19.91	19.9	19.9	19.89		(88)
Man internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m 18.13 18.32 18.7 19.23 19.66 19.87 19.91 19.91 19.77 19.23 16.6 18.11 (90) (1.4 - L) \text{Virging area + (4)} =	Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
Solution 18.13 18.32 18.7 19.23 19.66 19.87 19.91 19.91 19.71 19.23 18.66 18.1 (9)	(89)m=	1	0.99	0.98	0.95	0.83	0.61	0.42	0.49	0.8	0.97	0.99	1		(89)
Solution 18.13 18.32 18.7 19.23 19.66 19.87 19.91 19.91 19.71 19.23 18.66 18.1 (9)	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)			•	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 18.76				r						r 1		18.6	18.1		(90)
(92) (92) (92) (92) (18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92)										f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
(92) (92) (92) (92) (18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92)	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) x T2					
33 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93)				· `	i			i	· `	<u> </u>	19.72	19.17	18.74		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.65 0.47 0.54 0.82 0.96 0.99 1 Useful gains, hmGrn. W = (94)m x (84)m (95)m 423.1 464.73 512.49 563.19 555.3 431.57 296.43 307.45 410.43 424.55 406.86 405.45 Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 144.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((97)m - (95)m) x ((97)m - (1191.45 1153.28 1046.23 878.35 881.52 458.31 300.96 315.97 491.67 738.8 981.8 1187.27 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 571.65 462.7 397.1 226.91 39.91 0 0 0 0 233.81 413.96 581.67 Space heating: Fraction of space heat from secondary/supplementary systems including micro-CHP) Space heating: Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = (202) x [1 - (203)] = (2	Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
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 0.94 0.84 0.65 0.47 0.54 0.82 0.96 0.99 1 Useful gains, hmGm . W = (94)m x (84)m (95)m= 423.1 464,73 \$12.49 \$65.19 \$55.3 431.57 \$296.43 \$307.45 410.43 424.55 406.86 405.45 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14/6 16/6 16/4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) 1 (97)m= 1191.45 1153.28 1046.23 878.35 681.52 458.31 300.96 315.97 491.67 738.8 981.8 1187.27 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= \$571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 Total per year (kWh/year) = Sum(98). 58.07 = 2981.71 (98) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system. % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 482.7 397.1 226.91 93.91 0 0 0 0 0 233.81 413.96 581.67 (211)m = {(198)m x (204)} } x 100 + (206)	(93)m=	18.76	18.93	19.26	19.72	20.11	20.31	20.35	20.34	20.2	19.72	19.17	18.74		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Spa	ace hea	ting requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 1	tne ut			Ĭ			lun	l. d		Con	Oct	Nov	Doo		
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(95)me		I gains,	hmGm .			4)m									
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Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 1191.45 1153.28 1046.23 878.35 881.52 458.31 300.96 315.97 491.67 738.8 981.8 1187.27 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (98) (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98	Month	nly avera	age exte	rnal tem	perature	from T	able 8								
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 571.65	Heat I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	Г	ı	ı	
Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system O (201)	` '											<u> </u>	1187.27		(97)
Space heating requirement in kWh/m²/year 2981.71 (98)										i ì				I	
Space heating requirement in kWh/m²/year 45.01 (99) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (211) m = {[(98) m x (204)] } x 100 ÷ (206) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) ((98)m=	571.65	462.7	397.1	226.91	93.91	0	0							(oo)
9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 611.39 494.87 424.71 242.69 100.44 0 0 0 0 0 250.06 442.73 622.11									Tota	l per year ((kWh/year	r) = Sum(9	8) _{15,912} =	2981.71	=
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 0 233.81 413.96 581.67 (211)m = {[[(98)m x (204)] } x 100 ÷ (206) (211) (611.39 494.87 424.71 242.69 100.44 0 0 0 0 0 250.06 442.73 622.11	Space	e heatin	g require	ement in	kWh/m²	/year								45.01	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) Space heating requirement (calculated above) [571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67] (211) m = {[(98) m x (204)] } x 100 ÷ (206) [611.39 494.87 424.71 242.69 100.44 0 0 0 0 0 250.06 442.73 622.11]	9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (211) m = {[(98) m x (204)] } x 100 ÷ (206) (211) m = {[(98) m x (204)] } x 100 ÷ (206) (211) m = {[(98) m x (204)] } x 100 ÷ (206)	•		_			/		1							(00.4)
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 611.39 494.87 424.71 242.69 100.44 0 0 0 0 0 250.06 442.73 622.11		-					mentary	-	(000)	(004)				0	
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 611.39 494.87 424.71 242.69 100.44 0 0 0 0 250.06 442.73 622.11		-			-	• •			. ,	, ,				1	
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year				•	-				(204) = (2)	02) × [1 – ((203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above)	Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	າ, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	year
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ (211) $	Space	e heatin	g require	ement (c	alculate	d above)						ı	ı	
611.39 494.87 424.71 242.69 100.44 0 0 0 0 250.06 442.73 622.11		571.65	462.7	397.1	226.91	93.91	0	0	0	0	233.81	413.96	581.67		
	(211)m	= {[(98)m x (20	4)] } x 1	00 ÷ (20	6)	•	•				•			(211)
$Total (kWh/vear) = Sum(211) \dots = 3180 $ (211)		611.39	494.87	424.71	242.69	100.44	0	0							
715,1012									Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3189	(211)

(215)m = 0 0 0 0 0	0	0	0	0	0	0	0		
				-	_	215) _{15,1012}	_	0	(215)
Water heating				` ,	, ,	715,1012	l		(,
Output from water heater (calculated above)									
	35.75	130.6	143	142.64	160.28	169.19	181.36		_
Efficiency of water heater		-						79.8	(216)
` '	79.8	79.8	79.8	79.8	85.82	87.11	87.7		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	70.11	163.66	179.19	178.75	186.77	194.22	206.78		
			Tota	I = Sum(2	19a) ₁₁₂ =	-		2238.34	(219)
Annual totals					k\	Wh/year	, 	kWh/year	¬
Space heating fuel used, main system 1							ļ	3189	╣
Water heating fuel used								2238.34	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/year			sum	of (230a).	(2 30g) =			75	(231)
Electricity for lighting									
Lieutholty for lighting								297.09	(232)
Total delivered energy for all uses (211)(221) +	(231)	+ (232)	(237b)	=				297.09 5799.42	(232)
Total delivered energy for all uses (211)(221) +					ı				╡`
	s inclu	iding mid						5799.42	(338)
Total delivered energy for all uses (211)(221) +	s inclu				Emiss kg CO	ion fac 2/kWh	tor		(338)
Total delivered energy for all uses (211)(221) +	EnckW	iding mid				2/kWh	tor =	5799.42	(338)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1)	EnckW	ergy h/year			kg CO	2/kWh		5799.42 Emissions kg CO2/ye	(338) (338) ar
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary)	Enc kW (211	ergy h/year			kg CO2	2/kWh	= [5799.42 Emissions kg CO2/ye	(338) ar
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219	ergy h/year) ×	cro-CHP		0.2°	2/kWh	=	5799.42 Emissions kg CO2/yes 688.82 0	(338) ar (261)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary)	End kW (211 (215 (219 (261	ergy h/year) x) x	cro-CHP		0.2°	2/kWh 16 19	=	5799.42 Emissions kg CO2/yes 688.82 0 483.48	(338) (338) (338) (261) (263) (264)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	End kW (211 (215 (219 (261 (231	ergy h/year x x x x x y x y x y x y x y x y x y x	cro-CHP		0.2°	2/kWh 16 19 16	=	5799.42 Emissions kg CO2/ye 688.82 0 483.48 1172.3	(338) (338) (338) (261) (263) (264) (265)

TER =

(273)

20.61

SAP Input

Property Details: Sample 3 (Bottom)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height: $0 67 \text{ m}^2 3 \text{ m}$

Floor 0 67 m² 3 m

Living area: 27.3 m² (fraction 0.407)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	:	Argon:	Frame:
DOO	R	Manufactur <mark>e</mark>	er Solid				Wood
Ε		Manufacture	er Windows	low-E, En	= 0.05, soft coa	t No	
S		Manufacture	er Windows	low-E, En	= 0.05, soft coa	t No	
Balco	ony	Manufactur <mark>e</mark>	er Windows	low-E, En	= 0.05, soft coa	t No	

Name:	Gap:	Frame Fac	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
E		Е	East	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>:S</u>						
S	31.65	10.24	21.41	0.15	0	False	N/A
E	2.3	1.44	0.86	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	67			0.11			N/A

Internal Elements
Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 3 (Bottom) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3 (2a) = (3a) 67 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) total main secondary other m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (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

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m = 0	Adjusted infiltra	ation rate	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m				-	
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0				· ·	-	i -	· ·	0.12	0.13	0.14	0.14	0.15		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =			•	iale ioi l	пе аррп	Cable Ca	36						0.5	(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ± 100] 24a)m = 0.27	If exhaust air he	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
24a)m 0 .27	If balanced with	heat reco	very: effic	eiency in %	allowing t	or in-use f	actor (fron	n Table 4h) =				79.05	5 (23
b) If balanced mechanical ventiliation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24dym = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	b) If balance	d mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	o)m = (22	2b)m + (23b)		_	
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24e m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] 24d)m = 0	,				•					.5 × (23b	o)			
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 28im 0.27 0.26 0.26 0.25 0.24 0.23 0.23 0.22 0.23 0.24 0.25 0.25 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25/m=	,				•	•				0.5]			_	
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Net Area	3. Heat losses	s and he	eat loss	oaram e t	er:							_	_	
2.4						Net Ar	ea							ΑΧk
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Tabric heat loss, W/K = S (A x U) (26)(30) + (32) = (27.44 (28)(30) + (32) + (32a)(32e) = (250(30) + (32) + (32a)(32e) = (27.44 (28)(30) + (32) + (32a)(32e) = (27.44 (28)(30) + (32) + (32a)(32e) = (27.44 (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (27.44 (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)(32e) = (28)(31) + (32a)														(3
Fabric heat loss, W/K = S (A x U) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capa							ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative Value: Medium 250 17.17 17.17 17.17 17.17 18.18 19.18 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19					•			(26)(30) + (32) =				27.44	1 (3
for design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 44.61	leat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =		
an be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 44.61	hermal mass	parame	ter (TMF	= Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
details of thermal bridging are not known (36) = $0.05 \times (31)$ fotal fabric heat loss (33) + (36) = 44.61	· ·				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
(33) + (36) =	hermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						17.17	7 (3
			are not kn	nown (36) =	= 0.05 x (3	11)								
entilation neat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$											· ·		44.61	1 (3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				· ·						<u> </u>		i _	1	

		ı	i			i				ı		Í	
(38)m= 17.73	17.52	17.31	16.25	16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer of								· · · ·	= (37) + (1	
(39)m= 62.34	62.13	61.92	60.86	60.65	59.59	59.59	59.38	60.02	60.65	61.07	61.5	60.91	(39)
Heat loss parar	meter (H	HLP), W	m²K						= (39)m ÷	Sum(39) ₁ .	12 / 1 Z=	60.81	(39)
(40)m= 0.93	0.93	0.92	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.91	0.92		_
Number of days	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.91	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
										•	•		
4. Water heati	ing enei	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	nancy I	N									.17		(42)
if TFA > 13.9 if TFA £ 13.9), N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		. 17	,	(42)
Annual average	e hot wa										5.76		(43)
Reduce the annual not more that 125	_		• .		-	-	to achieve	a water us	se target o	f			
Jan	Feb	Mar	· ` `	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in			Apr ach month	,				Sep	Oct	INOV	Dec		
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
` / []										m(44) ₁₁₂ =		1029.18	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		_
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous wa	ater heati	na at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1349.41	(45)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage				10101	10101							ı	, ,
Storage volume	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	•			•			` '		(01.1				
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufactu		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b			• •					0		(49)
Energy lost from	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(50)
b) If manufactu			-									ı	
Hot water stora	-			e 2 (kW	n/litre/da	ıy)				0.	.02		(51)
Volume factor f	_		011 4.0							1.	.03		(52)
Temperature fa	actor fro	m Table	2b							—	.6		(53)
Energy lost from	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or (54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(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 22.51 23.26 (59)m= 23.26 22.51 23.26 (59)m= 23.26 21.01 23.26 22.51 23.26	(59)							
Combi loss calculated for each month (61)m = (60) ÷ 365 × (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)							
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	(63)							
FHRS 18.03 16.04 16.49 14.58 14.03 12.18 11.28 12.94 13.08 15.09 16.32 17.54	(63) (G2							
Output from water heater								
(64)m= 174.47 153.83 162.37 146.4 144.19 129.86 125.78 136.58 135.89 151.81 159.35 170.55								
Output from water heater (annual) ₁₁₂ 1791.08	(64)							
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]								
	(65)							
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= 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56	(66)							
	(00)							
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	(67)							
	(67)							
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	(00)							
	(68)							
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5								
(69)m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86	(69)							
Pumps and fans gains (Table 5a)								
(70)m =	(70)							
Losses e.g. evaporation (negative values) (Table 5)								
(71)m= -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 (0.85)	(71)							
Water heating gains (Table 5)								
(72)m= 121.96 119.98 115.87 110.27 106.64 101.53 97.18 102.75 104.73 110.52 117.06 119.99	(72)							
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$								
(73)m= 385.59 383.58 371.53 352.22 332.75 313.94 301.7 307.29 317.21 336.72 359.09 375.72	(73)							
6. Solar gains:								
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.								
Orientation: Access Factor Area Flux g_ FF Gains								
Table 6d m² Table 6a Table 6b Table 6c (W)								
East 0.9x 0.77 x 1.44 x 19.64 x 0.4 x 0.7 = 5.49	(76)							

East	0.9x	0.77	X	1.44	X	3	38.42		0.4	X	0.7	=	10.74	(76)
East	0.9x	0.77	x	1.44	X	63.27		x	0.4	X	0.7	=	17.68	(76)
East	0.9x	0.77	х	1.44	X	92.28		X	0.4	X	0.7	=	25.78	(76)
East	0.9x	0.77	X	1.44	X	113.09		x	0.4	x	0.7		31.6	(76)
East	0.9x	0.77	x	1.44	X	115.77		x	0.4	x	0.7		32.35	(76)
East	0.9x	0.77	х	1.44	X	110.22		x	0.4	x	0.7		30.8	(76)
East	0.9x	0.77	х	1.44	x	94.68		x	0.4	x	0.7	=	26.45	(76)
East	0.9x	0.77	x	1.44	X	7	3.59	x	0.4	x	0.7	=	20.56	(76)
East	0.9x	0.77	х	1.44	X	45.59		x	0.4	x	0.7	=	12.74	(76)
East	0.9x	0.77	х	1.44	X	24.49		x	0.4	X	0.7	=	6.84	(76)
East	0.9x	0.77	х	1.44	X	1	6.15	x	0.4	x	0.7	=	4.51	(76)
South	0.9x	0.77	х	5.44	X	4	6.75	x	0.4	x	0.7	=	49.35	(78)
South	0.9x	0.77	x	4.8	X	4	6.75	x	0.4	x	0.7	=	43.54	(78)
South	0.9x	0.77	x	5.44	x	7	6.57	x	0.4	x	0.7	=	80.82	(78)
South	0.9x	0.77	x	4.8	x	7	6.57	x	0.4	x	0.7	=	71.31	(78)
South	0.9x	0.77	x	5.44	X	9	7.53	x	0.4	x	0.7	=	102.95	(78)
South	0.9x	0.77	x	4.8	X	97.53		x	0.4	x	0.7	=	90.84	(78)
South	0.9x	0.77	x	5.44	X	1	0.23	Х	0.4	Х	0.7	=	116.36	(78)
South	0.9x	0.77	i x	4.8	x	1	0.23	x	0.4	X	0.7	=	102.67	(78)
Sout <mark>h</mark>	0.9x	0.77	x	5.44	х	11	4.87	į×	0.4	х	0.7	=	121.26	(78)
Sout <mark>h</mark>	0.9x	0.77	x	4.8	X	1	4.87	x	0.4	х	0.7	=	106.99	(78)
South	0.9x	0.77	j x	5.44	X	1	0.55	Х	0.4	х	0.7	=	116.69	(78)
South	0.9x	0.77	x	4.8	X	1	0.55	х	0.4	Х	0.7	=	102.96	(78)
South	0.9x	0.77	x	5.44	x	1(08.01	x	0.4	x	0.7	=	114.01	(78)
South	0.9x	0.77	x	4.8	X	10	08.01	x	0.4	х	0.7	=	100.6	(78)
South	0.9x	0.77	x	5.44	X	104.89		x	0.4	x	0.7	=	110.72	(78)
South	0.9x	0.77	x	4.8	X	10	104.89		0.4	x	0.7	=	97.7	(78)
South	0.9x	0.77	x	5.44	X	101.89		х	0.4	x	0.7	=	107.55	(78)
South	0.9x	0.77	x	4.8	X	101.89		x	0.4	x	0.7	=	94.9	(78)
South	0.9x	0.77	x	5.44	X	82.59		x	0.4	x	0.7	=	87.18	(78)
South	0.9x	0.77	x	4.8	X	82.59		х	0.4	x	0.7	=	76.92	(78)
South	0.9x	0.77	x	5.44	X	55.42		х	0.4	x	0.7	=	58.5	(78)
South	0.9x	0.77	X	4.8	j x	55.42		x	0.4	x	0.7	=	51.62	(78)
South	0.9x	0.77	x	5.44	X	40.4		x	0.4	x	0.7	=	42.64	(78)
South	0.9x	0.77	x	4.8	X	40.4		x	0.4	x	0.7	=	37.63	(78)
	_							•						
Solar g	ains in	watts, calcul	lated	for each mor	nth			(83)m	n = Sum(74)m	ı(82)n	1		_	
(83)m=	98.38		1.48	244.82 259.8		252 245.41		234	.88 223.01	176.8	116.95	84.78		(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts														
(84)m= 483.97 546.46 583.01 597.03 592.6 565.95 547.11 542.17 540.21 513.55 476.04 460.5 (84)							(84)							
7. Mea	an inter	nal tempera	ture ((heating seas	on)									
Tempe	Temperature during heating periods in the living area from Table 9, Th1 (°C)								21	(85)				
Utilisa	tion fac	tor for gains	for li	ving area, h1	,m (s	ee Ta	ble 9a)					1		
L	Jan	Feb N	/lar	Apr Ma	ıy	Jun	Jul	A	ug Sep	Oc	t Nov	Dec		
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	_					
(86)m= 0.99 0.99 0.97 0.93 0.84 0.65 0.48 0.5 0.73 0.93 0.99 1		(86)				
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)						
(87)m= 20.18 20.33 20.52 20.74 20.9 20.98 21 21 20.97 20.78 20.44 20.16		(87)				
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)						
(88)m= 20.14 20.14 20.15 20.16 20.16 20.18 20.18 20.18 20.17 20.16 20.16 20.15		(88)				
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)						
(89)m= 0.99 0.98 0.96 0.91 0.79 0.58 0.39 0.41 0.65 0.91 0.98 0.99		(89)				
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)						
(90)m= 19.06 19.27 19.54 19.86 20.07 20.17 20.18 20.18 20.15 19.92 19.45 19.03		(90)				
fLA = Living area ÷ (4) =	0.41	(91)				
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_				
(92)m= 19.52 19.7 19.94 20.21 20.41 20.5 20.51 20.51 20.48 20.27 19.85 19.49]	(92)				
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	I					
(93)m= 19.52 19.7 19.94 20.21 20.41 20.5 20.51 20.51 20.48 20.27 19.85 19.49		(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-calc	culate					
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:	l					
(94)m= 0.99 0.98 0.96 0.91 0.81 0.61 0.42 0.45 0.68 0.91 0.98 0.99		(94)				
Useful gains, hmGm , W = (94)m x (84)m	J					
(95)m= 479.68 536.39 560.58 544.81 477.3 344.35 232.38 243.23 368.39 467.11 466.47 457.34		(95)				
Monthly average external temperature from Table 8						
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)				
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m]	1	(07)				
(97)m= 948.58 919.51 832.1 688.65 528.07 351.52 233.05 244.17 382.99 586.3 778.98 940.32]	(97)				
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 348.86 257.46 202.01 103.57 37.77 0 0 0 0 88.68 225 359.34	1					
Total per year (kWh/year) = Sum(98) _{15,912} =	1622.69	(98)				
Space heating requirement in kWh/m²/year		」 (99)				
<u> </u>	24.22					
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; to includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	ne iallei					
Fraction of heat from Community boilers	1	(303a)				
Fraction of total space heat from Community boilers (302) x (303a) =	1	(304a)				
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)				
Distribution loss factor (Table 12c) for community heating system	1.05	(306)				
		」 ` ′				
Space heating Annual space heating requirement	kWh/year 1622.69	٦				
pp	1022.00	_				

Space heat from Community boilers	(98) x (304a) x (305) x (306) =	1703.83	(307a)
Efficiency of secondary/supplementary heating system in %	% (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary	y system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			_
Annual water heating requirement		1791.08	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)]	= 35.84	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not ente	er O) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	from outside	119.54	(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) =	119.54	(331)
Energy for lighting (calculated in Appendix L)		315.44	(332)
Total delivered energy for all uses (307) + (309) + (310) + ((312) + (315) + (331) + (332)(237b) =	4019.45	(338)
12b. CO2 Emissions - Community heating scheme			
CO2 from other sources of space and water heating (not C	Energy Emission factor kg CO2/kWh	kg CO <mark>2/ye</mark> ar	(367a)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) If there is CHF	kWh/year kg CO2/kWh	kg CO2/year](367a)](367)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) If there is CHF	kWh/year kg CO2/kWh HP) Using two fuels repeat (363) to (366) for the second	kg CO2/year	
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3)	kWh/year kg CO2/kWh SHP) Using two fuels repeat (363) to (366) for the second 107b)+(310b)] x 100 ÷ (367b) x 0.22	kg CO2/year fuel 95 = 814.99	(367)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3) Electrical energy for heat distribution	kWh/year kg CO2/kWh SHP) P using two fuels repeat (363) to (366) for the second 107b)+(310b)] x 100 ÷ (367b) x 10.22 [(313) x 0.52	kg CO2/year fuel 95 = 814.99 = 18.6	(367)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh HP) Using two fuels repeat (363) to (366) for the second 107b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x 0	kg CO2/year fuel 95 = 814.99 = 18.6 = 833.6	(367) (372) (373)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO2/kWh SHP) So using two fuels repeat (363) to (366) for the second 107b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x 0	kg CO2/year fuel 95 = 814.99 = 18.6 = 833.6 = 0](367)](372)](373)](374)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instar	kWh/year kg CO2/kWh HP) P using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x (363) (366) + (368) (372) (309) x 0 Intaneous heater (312) x (373) + (374) + (375) =	kg CO2/year fuel 95 = 814.99 = 18.6 = 833.6 = 0 = 0](367)](372)](373)](374)](375)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instart Total CO2 associated with space and water heating	kWh/year kg CO2/kWh SHP) Solution using two fuels repeat (363) to (366) for the second (367b)+(310b)] x 100 ÷ (367b) x (363)(366) + (368)(372) (309) x (309) x 0 Intaneous heater (312) x (373) + (374) + (375) =	kg CO2/year fuel 95 = 814.99 = 18.6 = 833.6 = 0 = 0](367)](372)](373)](374)](375)](376)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instart Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within contents.	kWh/year kg CO2/kWh HP) P using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x	kg CO2/year fuel 95 = 814.99 = 18.6 = 833.6 = 0 = 0 833.6 = 62.04](367)](372)](373)](374)](375)](376)](378)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the concepts of the conc	kWh/year kg CO2/kWh HP) P using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x	kg CO2/year fuel 95 = 814.99 = 18.6 = 833.6 = 0 = 0 833.6 = 62.04 = 163.72](367)](372)](373)](374)](375)](376)](378)](379)

			User [Details:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	Sampl	e 3 (Bott	om)			
Address :										
Overall dwelling dimen	sions:		Δ	- (m- 2)		Av. Ha	! or lo 4 / soo \		\/ala/ma	3)
Ground floor			Are	ea(m²) 67	(1a) x	Av. ne	ight(m)	(2a) =	Volume(m	3) (3a
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1r	1)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys		econdar eating	у П + Г	other 0	7 = 6	total 0	x	40 =	m³ per hou	.ır (6a
·]]			20 =		╡`
Number of open flues		0	」 ' L	0	」	0			0	(6b)
Number of intermittent fan	S				Ĺ	2		10 =	20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fire	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimneys	s. flues and fans = (6	a)+(6b)+(7	a)+(7b)+	(7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has be					continue f			. (-)	0.1	(-)
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2 if both types of wall are pre					•	ruction			0	(11
deducting areas of opening		portaing to	ine grea	ner wan are	a (anci					
If suspended wooden flo	oor, enter 0.2 (unseal	ed) or 0.	1 (seal	ed), 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) · ·	1001 -			0	(14
Window infiltration Infiltration rate				(8) + (10)	,	-	+ (15) =		0	(15
Air permeability value, q	150 expressed in cub	ic metre	s ner h					area	0	(16 (17
If based on air permeabilit	•			•	•	ictic oi c	лисюрс	arca	0.35	(17)
Air permeability value applies	=					is being u	sed		0.00	(
Number of sides sheltered	I								2	(19
Shelter factor				(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorporatir				(21) = (18) x (20) =				0.3	(21
Infiltration rate modified fo	1 1			1		1	1	1	1	
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan Feb M										
Monthly average wind spe	ed from Table 7	· · · · · ·						i	1	
Monthly average wind spe		3.8	3.8	3.7	4	4.3	4.5	4.7]	
Monthly average wind spe	ed from Table 7	3.8	3.8	3.7	4	4.3	4.5	4.7]	

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	Adjusted infiltr	ation rate	e (allowii	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
If exhancial ventilation: If exhancial ventilation: If exhancial ventilation: If exhancial ventilation with (23b) = (23a) × Fm/ (equation (NS)), otherwise (23b) = (23a) If exhancial ventilation with heat recovery, of the ventilation (NS) is a construction of the ventilation of the ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × (1 - (23a) + 100) [24a] If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × (1 - (23a) + 100) [24b] If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) × (1 - (23a) + 100) [24b] If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) [24b] If call house extract ventilation or positive input ventilation from outside if (22b)m × 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) [24c] If (22b)m × 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) [24c] If (22b)m × 0.5 × (23b), then (24c) = (23b); otherwise (24d)m = 0.5 + [(22b)m × 0.5] [24d] If (22b)m × 0.5 × (25b)			<u> </u>					<u> </u>	`	0.32	0.33	0.35		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a) \			_	ate for t	he appli	cable ca	se		!	!	!	!		
it balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =				ndiv N (2	2h) _ (22c) Em. (a	auation (N	IE\\ otho	nuico (22h) - (22a)				
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] 24ajm 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) = (23a)				(23b)
24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										21.) (001) [4 (00.)		(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·	 	-				<u> </u>		ŕ	, 		<u>`</u>	÷ 100] I	(245)
24)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		<u> </u>					·					0		(24a)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· -	1 1	-						í `	r Ó T				(24h)
if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) 24e)m		<u> </u>		-							0	0		(240)
24cjm= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,				•	•				5 v (23h)			
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	<u> </u>	1 1	` 		<u> </u>		· ·	<u> </u>	ŕ –	· ` ·		0		(24c)
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] 24d)m = 0.57	(1)	<u> </u>	n or who	ole hous	e nositiv	/e innut	ventilatio	n from l	oft.					` '
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 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 0.56 (25) 3. Heat losses and heat loss parameter ELEMENT Gross area (m²)	,					•				0.5]				
26)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 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	(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)
3. Heat osses and heat loss parameter. ELEMENT Gross area (m²) Openings	Effective air	change r	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				•	
A X U	(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)
A X U	3 Hoat losse	e and has	at lose n	aramot	or.									_
A ,m² W/m2K (W/K) kJ/m²-K kJ/K (26) 2.4						Net Ar	ea	U-valı	IE	AXII		k-value	2	AXk
Nindows Type 1											K)			
Vindows Type 2 S.44 x1/[1/(1.4) + 0.04] T.21 (27)	Doors					2.4	x	1	=	2.4				(26)
Alsa x1/[1/(1.4) + 0.04] = 6.36 (27)	Windows Type	e 1	7			1.44	x1/	/[1/(1.4)+	0.04] =	1.91	П			(27)
Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Comp	Windows Type	e 2				5.44	x1/	/[1/(1.4)+	0.04] =	7.21	П			(27)
Valls Type1 31.65 10.24 21.41 x 0.18 = 3.85 (29)	Windows Type	e 3				4.8	x1/	/[1/(1.4)+	0.04] =	6.36	5			(27)
Walls Type2 2.3 1.44 0.86 x 0.18 = 0.15 (29) Walls Type3 11.1 2.4 8.7 x 0.18 = 1.57 (29) Walls Type4 2.4 0 2.4 x 0.18 = 0.43 (29) Total area of elements, m² 114.45 (31) (31) (32) (31) (32) (32) (32) (32) (33) (34) (34) (34) (34) (34) (34) (35) (35) (36) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (37) (38) (37) (38) (37) (36) (37) (37) (38) (37) (38) (37) (38) (38) (37) (37) (38) (38) (37) (37) (38) (38) (38) (38) (38) (38) (37) (37) (38) (38) (39) (39) (39) (39) <td< td=""><td>Floor</td><td></td><td></td><td></td><td></td><td>67</td><td>x</td><td>0.13</td><td></td><td>8.71</td><td>= [</td><td></td><td></td><td>(28)</td></td<>	Floor					67	x	0.13		8.71	= [(28)
Walls Type2 2.3 1.44 0.86 x 0.18 = 0.15 (29) Walls Type3 11.1 2.4 8.7 x 0.18 = 1.57 (29) Walls Type4 2.4 0 2.4 x 0.18 = 0.43 (29) Total area of elements, m² 114.45 (31) (31) (32) (31) (32) (32) (32) (32) (33) (34) (34) (34) (34) (34) (34) (35) (35) (36) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (37) (38) (37) (38) (37) (36) (37) (37) (38) (37) (38) (37) (38) (38) (37) (37) (38) (38) (37) (37) (38) (38) (38) (38) (38) (38) (37) (37) (38) (38) (39) (39) (39) (39) <td< td=""><td>Walls Type1</td><td>31.65</td><td>5</td><td>10.24</td><td>4</td><td>21.41</td><td>X</td><td>0.18</td><td>= </td><td>3.85</td><td>F i</td><td></td><td>-</td><td>(29)</td></td<>	Walls Type1	31.65	5	10.24	4	21.41	X	0.18	=	3.85	F i		-	(29)
Walls Type3 11.1 2.4 8.7 X 0.18 1.57 (29) Walls Type4 2.4 0 2.4 X 0.18 1.57 (29) Total area of elements, m² 114.45 (31) If or windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28) (29) (31) (31) (32) (33) (48) (48) (10) (10) (10) (10) (11) (11) (12) (13) (13) (14) (14) (15) (16) (17) (17) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18)	Walls Type2				=		=		=		=		5 F	
Valls Type4 2.4 0 2.4 x 0.18 = 0.43 (29) Total area of elements, m² 114.45 (31) If or windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5492.18 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the same be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (33) + (36) = (34) (35) (36)							=		-		=		╡┝	
Total area of elements, m ² 114.45 (31) If or windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (38) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f then be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (38)m = 0.33 × (25)m × (5)	•				=		=		_		룩 ;		╡ ⊨	
for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions **Fabric heat loss, W/K = S (A x U) **Heat capacity Cm = S(A x k) **Intermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K **Indicative Value: Medium **Intermal bridges : S (L x Y) calculated using Appendix K **Intermal bridges : S (L x Y) calculated using Appendix K **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31)		L	 m²				=	0.10		0.40				
* include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (32.6 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5492.18 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K f details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (34) (35) (35) (36)		•		ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragraph	3.2	(01)
Heat capacity $Cm = S(A \times K)$. (,	J	, .		
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.72 (36) If details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = 38.32 (37) Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m × (5)	Fabric heat lo	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				32.6	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K f details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 38.32 (37) Ventilation heat loss calculated monthly	Heat capacity	Cm = S(A)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5492.	18 (34)
Finance and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly	Thermal mass	paramet	er (TMF	' = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
f details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = 38.32 (37) (4) (4) (5) (38) m = $0.33 \times (25)$ m × (5)	ŭ				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Total fabric heat loss $ (33) + (36) = $ $ /entilation heat loss calculated monthly (38)m = 0.33 \times (25)m \times (5) $	Thermal bridg	es : S (L :	x Y) cald	culated (using Ap	pendix ł	<						5.72	(36)
/entilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5)			are not kno	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			38.3	2 (37)
			lculated	monthly	/						25)m x (5))	33.0.	` ′
I JOHN I TEN I IVION I ANN I IVION I JUNI I JUNI I JUNI I JEN I JUNI I IVOV I DECI	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 37.92 37.74 37.56 36.71 36.55 35.81 35.81 35.67 36.09 36.55 36.87 37.21	(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
(39)m= 76.25 76.06 75.88 75.03 74.87 74.13 74.13 73.99 74.42 74.87 75.19 75.53	(20)
Average = Sum(39) ₁₁₂ /12= 75.03 Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)	(39)
(40)m= 1.14 1.13 1.12 1.11 1.11 1.11 1.11 1.11 1.12 1.13	
Average = $Sum(40)_{112}/12=$ Number of days in month (Table 1a)	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.17	(42)
Assumed occupancy, N = $1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	
(44)m= 94.34 90.91 87.48 84.05 80.62 77.19 77.19 80.62 84.05 87.48 90.91 94.34	
Total = Sum(44) ₁₁₂ = 1029.	18 (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= 139.91 122.36 126.27 110.08 105.63 91.15 84.46 96.92 98.08 114.3 124.77 135.49	
Total = $Sum(45)_{112}$ = 1349. If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)
	(46)
(46)m= 20.99 18.35 18.94 16.51 15.84 13.67 12.67 14.54 14.71 17.15 18.72 20.32 Water storage loss:	(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year (48) × (49) = 0.75	(50)
b) If manufacturer's declared cylinder loss factor is not known:	(00)
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52) (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(54)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	· ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated f	or each month (59)m = (58) ÷ 365 × (41)	m				•	
(modified by factor from Tabl	e H5 if there is s	olar water	heating and a	cylinder	r thermo	stat)		•	
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 2	3.26 23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365	× (41)m						
(61)m= 0 0 0	0 0	0	0 0	0	0	0	0		(61)
Total heat required for water he	eating calculated	for each m	nonth (62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 186.5 164.45 172.86	155.17 152.22	136.24 13	31.06 143.52	143.17	160.9	169.86	182.09		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative o	quantity) (enter '0	' if no solar	r contribut	ion to wate	r heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, se	ee Appendix (3)					
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0 0	0	0	0	0		(63) (G2
Output from water heater									
(64)m= 186.5 164.45 172.86	155.17 152.22	136.24 13	31.06 143.52	143.17	160.9	169.86	182.09		
		-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat gains from water heating,	kWh/month 0.25	5´[0.85 × ((45)m + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m= 83.79 74.35 79.26	72.68 72.4	66.38 6	5.36 69.5	68.68	75.28	77.56	82.33		(65)
include (57)m in calculation of	of (65)m only if c	ylinder is in	the dwelling	or hot wa	ater is fr	om com	munity h	eating	
5. Internal gains (see Table 5	and 5a):								
Metabolic gains (Table 5), Wat	ts								
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56	08.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	pendix L, equati	on L9 or L9	9a), also see	Table 5					
(67)m= 17.41 15.46 12.58	9.52 7.12	6.01	6.49 8.44	11.33	14.38	16.79	17.89		(67)
Appliances gains (calculated in	Appendix L, eq	uation L13	or L13a), also	see Tal	ole 5			•	
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 14	42.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	opendix L, equat	ion L15 or	L15a), also se	ee Table	5			•	
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 3	3.86 33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	<u>. </u>	•	•			•		•	
(70)m= 3 3 3	3 3	3	3 3	3	3	3	3		(70)
Losses e.g. evaporation (negat	tive values) (Tab	le 5)	•					•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -8	36.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)	•	•	•					•	
(72)m= 112.63 110.65 106.53	100.94 97.31	92.19 8	7.85 93.42	95.4	101.18	107.72	110.65		(72)
Total internal gains =		(66)m +	+ (67)m + (68)m +	+ (69)m + (70)m + (7	1)m + (72)	m		
(73)m= 378.8 376.85 364.87	345.64 326.23	307.45 2	95.2 300.74	310.58	330.01	352.32	368.92		(73)
6. Solar gains:									
Solar gains are calculated using solar	r flux from Table 6a a	and associate	d equations to co	onvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux	0	g_ 	_	FF		Gains	
Table 6d	m²	Table	ьа Т 	able 6b	_ T	able 6c		(W)	_
East 0.9x 0.77 x	1.44	x 19.6	4 X	0.63	x	0.7	=	8.64	(76)

East	0.9x	0.77	X	1.44	X	38.42	×	0.63	x	0.7	=	16.91	(76)
East	0.9x	0.77	x	1.44	x	63.27	X	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77	x	1.44	х	92.28	X	0.63	х	0.7	=	40.61	(76)
East	0.9x	0.77	×	1.44	x	113.09	X	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	×	1.44	x	115.77	X	0.63	x	0.7	<u> </u>	50.95	(76)
East	0.9x	0.77	×	1.44	x	110.22	X	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	×	1.44	x	94.68	X	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	×	1.44	x	73.59	X	0.63	x	0.7	<u> </u>	32.39	(76)
East	0.9x	0.77	×	1.44	x	45.59	X	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	×	1.44	x	24.49	X	0.63	x	0.7	=	10.78	(76)
East	0.9x	0.77	×	1.44	x	16.15	X	0.63	x	0.7	<u> </u>	7.11	(76)
South	0.9x	0.77	×	5.44	x	46.75	X	0.63	x	0.7	=	77.73	(78)
South	0.9x	0.77	×	4.8	x	46.75	X	0.63	x [0.7	=	68.58	(78)
South	0.9x	0.77	×	5.44	x	76.57	T x	0.63	x	0.7	=	127.3	(78)
South	0.9x	0.77	×	4.8	x	76.57	i x	0.63	x	0.7	=	112.32	(78)
South	0.9x	0.77	×	5.44	j x	97.53	Īx	0.63	x [0.7	=	162.15	(78)
South	0.9x	0.77	×	4.8	x	97.53	Īx	0.63	×	0.7	=	143.08	(78)
South	0.9x	0.77	x	5.44	X	110.23	Х	0.63	Х	0.7	=	183.27	(78)
South	0.9x	0.77	×	4.8	x	110.23	x	0.63	x	0.7		161.71	(78)
South	0.9x	0.77	×	5.44	x	114.87	i 📈	0.63	x	0.7	=	190.98	(78)
South	0.9x	0.77	×	4.8	X	114.87	1 /x	0.63	×	0.7	=	168.51	(78)
South	0.9x	0.77	×	5.44	x	110.55	X	0.63	×	0.7	_	183.79	(78)
South	0.9x	0.77	٦ ×	4.8	x	110.55	X	0.63	x	0.7		162.17	(78)
South	0.9x	0.77	× ا	5.44	x	108.01	i x	0.63	×	0.7		179.57	(78)
South	0.9x	0.77	T x	4.8	x	108.01	j x	0.63	×	0.7	-	158.45	(78)
South	0.9x	0.77	×	5.44	x	104.89	i x	0.63	×	0.7	=	174.39	(78)
South	0.9x	0.77	×	4.8	X	104.89	j ×	0.63	×	0.7	=	153.87	(78)
South	0.9x	0.77	×	5.44	j×	101.89	j ×	0.63	x	0.7	-	169.39	(78)
South	0.9x	0.77	×	4.8	x	101.89	j x	0.63		0.7	=	149.46	(78)
South	0.9x	0.77	×	5.44	x	82.59	j ×	0.63		0.7		137.3	(78)
South	0.9x	0.77	×	4.8	j x	82.59	j ×	0.63	x	0.7	_ =	121.15	(78)
South	0.9x	0.77	×	5.44	x	55.42	X	0.63	x	0.7	=	92.13	(78)
South	0.9x	0.77	×	4.8	x	55.42	i x	0.63	x	0.7		81.29	(78)
South	0.9x	0.77	×	5.44	X	40.4	x	0.63	x	0.7	=	67.16	(78)
South	0.9x	0.77	×	4.8	x	40.4	X	0.63	x	0.7	=	59.26	(78)
	L				_		_						
Solar ga	ains in	watts, calcu	ulated	for each mon	ıth		(83)m	n = Sum(74)m	(82)m				
(83)m=	154.95	256.53 33	33.08	385.59 409.2	6 3	96.91 386.53	369	.93 351.23	278.51	184.2	133.53		(83)
Total ga	ains – i	nternal and	solar	(84)m = (73) r	n + (83)m , watts				_			
(84)m=	533.75	633.37 69	97.95	731.22 735.4	9 7	04.36 681.72	670	.67 661.81	608.52	536.52	502.45		(84)
7. Mea	an inter	nal tempera	ature (heating seas	on)								
Tempe	erature	during hea	ting pe	eriods in the I	iving	area from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gain	s for li	ving area, h1	,m (s	ee Table 9a)							
	Jan	Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
Stroma F	 SAP 201	2 Version: 1 0	5 51 (9	SAP 9 92) - http:/	//\^\^\	stroma com		· · · ·				Page	5 of 7

Mean internal temperature in whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 15 15 15 14 1971 20.4 20.7 20.38 20.4 20.4 20.6 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 2															
Section 19.95 20.15 20.4 20.66 20.86 20.97 20.98 20.99 20.94 20.80 20.27 19.92 19.92 19.92 19.92 19.92 19.92 19.93 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.	(86)m=	0.99	0.98	0.96	0.91	0.81	0.64	0.47	0.5	0.72	0.92	0.98	0.99		(86)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C)	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
Company 19.97 19.97 19.97 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19	(87)m=	19.96	20.15	20.4	20.66	20.86	20.97	20.99	20.99	20.94	20.69	20.27	19.92		(87)
Wellistation factor for gains for rest of dwelling, h2 m (see Table 9a)	Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m	(88)m=	19.97	19.97	19.97	19.98	19.99	20	20	20	19.99	19.99	19.98	19.98		(88)
Mean intermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
Solution 18.6 18.89 13.23 19.6 19.86 19.88 19.98 19.99 19.95 19.66 19.07 18.55 (9)	(89)m=	0.99	0.98	0.95	0.89	0.76	0.55	0.37	0.39	0.63	0.89	0.98	0.99		(89)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)mm 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.38 20.08 19.56 19.11 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)mm 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (92)	(90)m=	18.6	18.89	19.23	19.6	19.86	19.98	19.99	19.99	19.95	19.66	19.07	18.55		(90)
19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (92)										f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (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 0.99 0.97 0.95 0.88 0.78 0.59 0.41 0.44 0.67 0.89 0.97 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m 527.45 616.68 660.14 648.81 570.04 415.14 280.11 289.69 440.29 544.15 522.89 497.9 Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 9.9 11.7 146 16 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W = (39)m x [(39)m - (95)m] x (41)m (98)m 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 Space heating requirements Individual heating systems including micro-CHP) Space heating requirements Individual heating systems including micro-CHP Space heating requirement from main system 1 (204) = (202) x [1 - (203)] = 1 - (201) = 1 - (202)	Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
Sepace heating requirement 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (93)	(92)m=	19.15	19.4	19.71	20.04	20.27	20.38	20.4	20.4	20.36	20.08	19.56	19.11		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m 0.99 0.97 0.95 0.89 0.78 0.59 0.41 0.44 0.67 0.89 0.97 0.99 Useful gains, hmGrn W = (94)m x (84)m (95)m 527.45 616.86 660.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 144.6 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) (132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)s. p = 2107.29 (98) Space heating: Fraction of space heat from secondary/supplementary systems including micro-CHP) Space heating: Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (204) (204) (202) x [1 - (203)] = 1 (204) (204) (204) (204) (202) x [1 - (203)] = 1 (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (204) (2	Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: [94]m= 0.99 0.97 0.95 0.89 0.78 0.59 0.78 0.59 0.41 0.44 0.67 0.89 0.97 0.99 Useful gains, hmGm . W = (94)m x (84)m (95)m = 527.45 616.88 560.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 146.6 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) = (132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 336.7 1125.95 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x ((41)m (98)m = 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98). 56.7 2 2107.29 (98) Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) =	. ,					20.27	20.38	20.4	20.4	20.36	20.08	19.56	19.11		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							- 1 -1 -1	44 . (T-1.1- 01	41 -	(T' /:	70)		l	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							ed at ste	ep 11 of	able 9	o, so tha	t II,m=(/6)m an	d re-calc	ulate	
(94) (94) (94) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (9				Ň			Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm, W = (94)m x (84)m (95)m = 527.45 616.68 660.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 (95)	Util <mark>is</mark> a	ation fac	tor for g	ains, hm	:										
(95)me 527.45 616.68 660.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 Monthly average external temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)me 1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)sz = 2107.29 (98) Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) x [1 - (203)] = 1 (204) (204) (202) x [1 - (203)] = 1 (204) (204) (202) x [1 - (203)] = 1 (204) (204) (208) Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)]} x 100 ÷ (206) (211)	(94)m=	0.99	0.97	0.95	0.89	0.78	0.59	0.41	0.44	0.67	0.89	0.97	0.99		(94)
Monthly average external temperature from Table 8 (96) m = 4.3	Usefu			<u> </u>	<u> </u>										
(96) 1.	` '							280.11	293.69	440.29	544.15	522.89	497.9		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m = (1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m = (450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)sa2 = (2107.29 (98) Space heating requirement in kWh/m²/year 31.45 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) =								40.0	40.4	444	10.0	7.4	4.0		(06)
(97) m= 1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)ssv = 2107.29 (98) Space heating requirement in kWh/m²/year 31.45 (99) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heating from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211)							l					7.1	4.2		(90)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98) ₁₋₂₈₋₁₂ = 2107.29 (98) Space heating requirement in kWh/m²/year				1	·		r	-``				936.7	1125.95		(97)
Space heating requirement in kWh/m²/year State Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system O (201)	. ,			<u> </u>		nonth, k		<u> </u>	<u> </u>			<u> </u>			
Space heating requirement in kWh/m²/year 31.45 (99)	•		 					1		``		 	467.27		
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) × [1 - (203)] = 1 (204) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 0 131.66 318.65 499.75									Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2107.29	(98)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211)	Spac	e heatin	g require	ement in	kWh/m²	/year								31.45	(99)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211)	9a. En	ergy rec	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75								3		,					
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75	Fract	ion of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75	Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	Fract	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 481.39 349.61 272.17 143.75 56.79 0 0 0 131.66 318.65 499.75	Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above)	Efficiency of secondary/supplementary heating system, %								0	(208)					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	— /ear
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (212) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (213) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (214) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (215) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (216) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (217) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (218) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 $ $ ($	Spac	e heatin	g require	ement (c	alculate	d above)								
481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75		450.1	326.88	254.48	134.4	53.1	0	0	0	0	123.1	297.94	467.27		
	(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
Total (kWh/year) = Sum(211) _{1.5,10.112} = 2253.78 (211)		481.39	349.61	272.17	143.75	56.79	0	0		_					
									Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2253.78	(211)

215)m= 0 0 0 0 0	0 0	0 0	0	0	0		
		Total (kWh/y	rear) =Sum(2	215) _{15,1012}	=	0	(21
Nater heating					L		_
Output from water heater (calculated above)			7 100 0	400.00	100.00		
186.5	36.24 131.06	143.52 143.1	7 160.9	169.86	182.09	70.0	(210
· · · · · · · · · · · · · · · · · · ·	79.8 79.8	79.8 79.8	84.11	86.3	87.22	79.8	ارکار 21:)
Fuel for water heating, kWh/month	70.0	70.0		00.0	01.22		(
219)m = (64)m x 100 ÷ (217)m				ī	1		
219)m= 214.17 189.87 201.37 183.78 184.92 1	70.73 164.23	179.84 179.4		196.83	208.76		_
		Total = Sum				2265.21	(219
Annual totals Space heating fuel used, main system 1			K	Wh/year	r [kWh/year 2253.78	7
Nater heating fuel used					<u> </u>	2265.21	╡
Electricity for pumps, fans and electric keep-hot					Ţ	2203.21	
							(00
central heating pump:					30		(23
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year		sum of (230	a)(230g) =			75	(23
Electricity for lighting						307.48	(23
Fotal delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				4901.47	(33
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP					
	Energy		Emiss	ion fac	tor	Emissions	
			kg CO			kg CO2/yea	ar
	kWh/year		U				_
Space heating (main system 1)	(211) x		0.2	16	=	486.82	(26
Space heating (main system 1) Space heating (secondary)	•				= [= [486.82	(26 (26
Space heating (secondary)	(211) x		0.2	19	L		(26
Space heating (secondary) Vater heating	(211) x (215) x (219) x	+ (263) + (264) =	0.2	19	= [0	_
	(211) x (215) x (219) x	+ (263) + (264) =	0.2	19	= [0 489.29	(26 (26
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262)	+ (263) + (264) =	0.2	19 16 19	= [0 489.29 976.1	[] (26] (26] (26

TER =

(273)

17.53

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Flat Dwelling type:

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 67 m² 3 m

Floor 0

27.3 m² (fraction 0.407) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame
DOO	R	<u>Manuf</u> actur <mark>er</mark>	Solid			Wood
W		Manufacturer	Windows	low-E, $En = 0.05$, soft coat No	
S		Manufacturer	Windows	low-E, En = 0.05	, soft coat No	
Balco	ony	Manufactur <mark>e</mark> r	Windows	low-E, $En = 0.05$, <mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen	<u>ts</u>						
S	31.7	10.24	21.46	0.15	0	False	N/A
W	19	1.44	17.56	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	67			0.11			N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

			User [Details:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa				Versio	on: 1.0.5.51	
		Pr	operty	Address	Sample	e 4 (Bott	om)			
Address :										
1. Overall dwelling dimer	nsions:		A	- (2)		A., 11a	! au la 4 (au a)		Value of m	2)
Ground floor			Are	a(m²) 67	(1a) x	Av. ne	ight(m)	(2a) =	Volume(m	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	heating h	econdary neating	у 7 + Г	other	7 ₌ F	total		40 =	m³ per hou	_
ŕ		0	╛╘	0	<u> </u>	0		20 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0			0	(6b)
Number of intermittent far	าร					0	X	10 =	0	(7a)
Number of passive vents						0	Х	10 =	0	(7b)
Number of flueless gas fir	res					0	X ·	40 =	0	(7c)
								Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimney	s, flues and fans = (6	a)+(6b)+(7a	a)+(7b)+((7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be	een carried out or is intende	ed, proceed	I to (17),	otherwise o	ontinue fi	rom (9) to	(16)			
Number of storeys in th	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration Structural infiltration: 0.	25 for stool or timber	frome or	0.25 fo	r macan	v const	ruotion	[(9)	-1]x0.1 =	0	(10
if both types of wall are pro					•	ruction			0	(11
deducting areas of opening	gs); if equal user 0.35	-								_
If suspended wooden fl	,	led) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent		trinnad							0	(13
Percentage of windows Window infiltration	and doors draught s	прреа		0.25 - [0.2	x (14) ÷ 1	1001 =			0	(14 (15
Infiltration rate				(8) + (10)	` '	•	+ (15) =		0	(13
Air permeability value,	g50, expressed in cub	oic metres	s per ho					area	3	(17
If based on air permeabili	•		•	•	•				0.15	 (18
Air permeability value applies	s if a pressurisation test ha	s been don	e or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	d			(00) 4	0 07F ·· (40)1			2	(19
Shelter factor	Carabaltan tautan			(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorporati				(21) = (18)	(20) =				0.13	(21)
Infiltration rate modified fo		1	Jul	Λιια	Son	Oct	Nov	Doo	1	
	Mar Apr May	Jun	Jui	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind specification (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)11- 3.1	7.0 7.7 4.0] 3.0	5.0	J 3.7	7	1 4.3	1 4.5	L'	J	
Wind Factor (22a)m = (22	2)m ÷ 4								_	

	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
alcul ate effe d		-	ate for t	he appli	cable ca	se					<u> </u>	<u> </u>	
If mechanica	al ventilati	on:										0.5	(2
If exhaust air he		0		, ,	, ,	. `	,, .	,) = (23a)			0.5	(2
If balanced with	heat recov	ery: effici	ency in %	allowing f	or in-use fa	actor (from	n Table 4h) =				79.05	(2
a) If balance						<u> </u>		``	2b)m + (2	23b) × [′	· ` ´	÷ 100]	
4a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
b) If balance							- ^ ` 	<u> </u>	<u> </u>	•	ı	1	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole he if (22b)m	ouse extr $1 < 0.5 \times 0$			-	-				5 × (23b)		_	
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural vif (22b)m	ventilatior n = 1, ther			•	•				0.5]				
ld)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change ra	ate - en	ter (24a	or (24b	o) or (24d	c) or (24	d) in box	(25)				-	
i)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
. Heat losses	s and hea	t loss r	paramete	ir.								_	
EMENT	Gross area (ı	3	Openin m	gs	Net Ard A ,n		U-valı W/m2		A X U (W/k	()	k-value kJ/m²-l		A X k kJ/K
oo <mark>rs</mark>					2.4	x	1.4	= [3.36				(2
n <mark>dows</mark> Type	: 1				1.44	x .	1/[1/(1)+ (0.04] =	1.38	Ħ			(:
ndows Type	2	,			5.44	元 /x ·	1/[1/(1)+ (0.04] =	5.23	Ħ			(2
ndows Type	3				4.8	— x ·	1/[1/(1)+ (0.04] =	4.62	5			(:
oor					67	X	0.11	─	7.37				(2
	04.7	\neg	10.24	1	21.46	x	0.15	-	3.22	=			
alls Type1	I 31./									룩 ;		-	_
	31.7	=	1.44		17.56	x	0.15	=	2.63				10
alls Type1 alls Type2 alls Type3	19		1.44		17.56	=	0.15	= [= [2.63				_
alls Type2	19		2.4		8.7	x	0.15	= [1.3				
alls Type2 alls Type3 alls Type4	19 11.1 2.4	m²			8.7 2.4	x x		=					(
alls Type2	19 11.1 2.4 Ilements,	ws, use e	2.4 0	ndow U-va	8.7 2.4 131.2	x x	0.15	= [1.3 0.84	s given in	paragraph	3.2	(1
alls Type2 alls Type3 alls Type4 tal area of e or windows and nclude the area	19 11.1 2.4 Ilements, a roof window as on both sa	ws, use e ides of in	2.4 0	ndow U-va	8.7 2.4 131.2	x x	0.15	= [= [/[(1/U-valu	1.3 0.84	s given in	paragraph	3.2	(:
alls Type2 alls Type3 alls Type4 tal area of e or windows and nclude the area bric heat los	19 11.1 2.4 lements, roof window as on both si ss, W/K =	ws, use e ides of in S (A x	2.4 0	ndow U-va	8.7 2.4 131.2	x x	0.15 0.35	= [= [/[(1/U-valu + (32) =	1.3 0.84				(;
alls Type2 alls Type3 alls Type4 tal area of e	19 11.1 2.4 Ilements, roof window as on both si ss, W/K = Cm = S(A	ws, use e ides of in S (A x A x k)	2.4 0 ffective winternal wall U)	ndow U-va	8.7 2.4 131.2 alue calculatitions	x x x ated using	0.15 0.35	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as	?) + (32a).		29.96	(;
alls Type2 alls Type3 alls Type4 tal area of e or windows and include the area bric heat lose eat capacity of ermal mass or design assess	19 11.1 2.4 Ilements, roof window as on both si as, W/K = Cm = S(A paramete	ws, use e ides of in S (A x A x k) er (TMF re the dea	2.4 0 ffective winternal wall U) P = Cm ÷	ndow U-va s and pan	8.7 2.4 131.2 alue calculatitions	x x ated using	0.15 0.35 of formula 1.	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as .(30) + (32)	?) + (32a). Medium	(32e) =	29.96 5726.68	
alls Type2 alls Type3 alls Type4 tal area of e or windows and include the area bric heat lose eat capacity (19 11.1 2.4 Ilements, I roof window as on both si as, W/K = Cm = S(A paramete sments when ad of a deta	ws, use e ides of in S (A x A x k) er (TMF re the den	2.4 0 ffective winternal walk U) P = Cm ÷ tails of the ulation.	ndow U-ve s and pan - TFA) ir construct	8.7 2.4 131.2 alue calculations kJ/m²K fron are not	x x ated using	0.15 0.35 of formula 1.	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as .(30) + (32)	?) + (32a). Medium	(32e) =	29.96 5726.68	(:
alls Type2 alls Type3 alls Type4 tal area of e or windows and include the area bric heat los eat capacity (ermal mass or design assess in be used instea	19 11.1 2.4 Ilements, I roof window as on both si as, W/K = Cm = S(A paramete sments when ad of a deta es : S (L x al bridging a	ws, use e ides of in S (A x A x k) er (TMF re the det ided calcu x Y) calc	2.4 0 ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part	8.7 2.4 131.2 alue calculations kJ/m²K fon are not spendix k	x x ated using	0.15 0.35 of formula 1.	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as .(30) + (32 tive Value: values of	?) + (32a). Medium	(32e) =	29.96 5726.68 250	

								1			I	(2.5)
` '	52 17.31		16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer coeff	 _		1	T	T	T	- ` 	= (37) + (T	I	
(39)m= 67.37 67	16 66.94	65.89	65.68	64.62	64.62	64.41	65.04	65.68	66.1	66.52	65.02	(39)
Heat loss paramet	er (HLP), \	N/m²K						= (39)m ÷	Sum(39) ₁ - (4)	12 / 1 Z=	65.83	(39)
(40)m= 1.01	1	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.99	0.99		_
Number of days in	month (Ta	able 1a)					,	Average =	Sum(40)₁	12 /12=	0.98	(40)
	eb Mai		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	8 31	30	31	30	31	31	30	31	30	31		(41)
L .	!		•				l				J	
4. Water heating	energy rec	uirement:								kWh/ye	ear:	
Assumed secures	ov. N										ı	(40)
Assumed occupar if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76	x [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.17		(42)
Annual average h		age in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		85	5.76	1	(43)
Reduce the annual ave	rage hot wat	er usage by	5% if the c	lwelling is	designed			se target o			1	, ,
not more that 125 litres		7 1			<u>, </u>			0 1				
Jan F Hot water usage in litre	eb Mai		May	Jun	Jul Table 1c x	(43)	Sep	Oct	Nov	Dec		
(44)m= 94.34 90			80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
(44)111= 34.34 30	51 07.40	04.00	00.02	77.15	17.15	00.02			m(44) ₁₁₂ :		1029.18	(44)
Energy content of hot w	vater used - d	ca <mark>lculate</mark> d m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			` '			` ′
(45)m= 139.91 122	.36 126.2	7 110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If instantaneous water	hooting of no	int of upo (n	o hot wata	r otorogo)	ontor O in	hoves (46		Total = Su	m(45) ₁₁₂ :	=	1349.41	(45)
		<u> </u>	1		1	· ·	. , ,	47.45	10.70	00.00	1	(46)
(46)m= 20.99 18 Water storage loss	35 18.94 :	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volume (li	res) includ	ding any s	olar or V	WHRS	storage	within sa	ame ves	sel		0		(47)
If community heati	ng and no	tank in dv	velling, e	enter 110) litres in	(47)					1	
Otherwise if no sto		ater (this i	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water storage loss a) If manufacturer		d loss fact	or is kno	wn (kWł	n/day).					0		(48)
Temperature factor			000	(., a.a.y / .					0		(49)
Energy lost from w			ear			(48) x (49)) =			10		(50)
b) If manufacturer	's declared	d cylinder	loss fact									, ,
Hot water storage			le 2 (kW	h/litre/da	ay)				0	.02		(51)
If community heati Volume factor fron	-	JUON 4.3							1	.03		(52)
Temperature factor		le 2b							-).6		(53)
Energy lost from w	ater storaç	ge, kWh/y	ear			(47) x (51)) x (52) x (53) =	1	.03		(54)
Enter (50) or (54)	in (55)								1	.03		(55)
Water storage loss	calculated	d for each	month			((56)m = (55) × (41)	m				
` '	92 32.01		32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dec	icated solar s	storage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	60), else (5	7)m = (56)	m where (H11) is fro	om Append	ix H	
(57)m= 32.01 28	92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated f	for each month (59)m = (58)	÷ 365 × (41)	m				•	
(modified by factor from Tab	le H5 if there is	solar water h	neating and a	cylinder	thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23	3.26 23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365 ×	د (41)m						
(61)m= 0 0 0	0 0	0	0 0	0	0	0	0		(61)
Total heat required for water he	eating calculated	for each m	onth (62)m =	: 0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.18 172.29 181.54	163.58 160.9	144.64 13	9.74 152.2	151.57	169.58	178.26	190.77		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative qu	uantity) (enter '0	if no solar	contribut	ion to wate	r heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, se	e Appendix (3)					
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 18.03 16.04 16.49	14.58 14.03	12.18 11	1.28 12.94	13.08	15.09	16.32	17.54		(63) (G2
Output from water heater									
(64)m= 174.47 153.83 162.37	146.4 144.19	129.86 12	5.78 136.58	135.89	151.81	159.35	170.55		_
			Out	out from wa	ater heate	r (annual) ₁	12	1791.08	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (4	45)m + (61)n	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.74 80.63 86.21	79.4 79.34	73.1 72	2.31 76.45	75.41	82.23	84.28	89.27		(65)
include (57)m in calculation	of (65)m only if c	ylinder is in	the dwelling	or hot wa	ate <mark>r is</mark> fr	om com	munity h	eating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	ts								
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56 10	8.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	opendix L, equat	ion L9 or L9	a), also see	Table 5					
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6	.66 8.66	11.62	14.75	17.22	18.36		(67)
Appliances gains (calculated in	n Appendix L, eq	uation L13 o	or L13a), also	see Tal	ole 5	-			
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 14	2.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	ppendix L, equa	tion L15 or L	_15a), also s	ee Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 33	33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	5a)		=	-		-			
(70)m= 0 0 0	0 0	0	0 0	0	0	0	0		(70)
Losses e.g. evaporation (negative	tive values) (Tab	ole 5)	•	•				•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -8	6.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)		-						•	
(72)m= 121.96 119.98 115.87	110.27 106.64	101.53 97	7.18 102.75	104.73	110.52	117.06	119.99		(72)
Total internal gains =		(66)m +	(67)m + (68)m	+ (69)m + (70)m + (7	1)m + (72)	m	•	
(73)m= 385.59 383.58 371.53	352.22 332.75	313.94 30	01.7 307.29	317.21	336.72	359.09	375.72		(73)
6. Solar gains:			·						
Solar gains are calculated using solar	r flux from Table 6a	and associated	l equations to co	onvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table (6a T	g_ able 6b	Т	FF able 6c		Gains (W)	
O a vith					T x Г			, ,	(78)
South 0.9x 0.77 x	5.44	X 46.75	<u> </u>	0.4	」 ^ L	0.7	=	49.35	J(10)

	-					_				_ ,				_
South	0.9x	0.77	X	4.8		x	46.75	X	0.4	X	0.7	=	43.54	(78)
South	0.9x	0.77	X	5.44		×	76.57	X	0.4	X	0.7	=	80.82	(78)
South	0.9x	0.77	X	4.8		x	76.57	X	0.4	x	0.7	=	71.31	(78)
South	0.9x	0.77	X	5.44		X	97.53	X	0.4	X	0.7	=	102.95	(78)
South	0.9x	0.77	X	4.8		x	97.53	X	0.4	X	0.7	=	90.84	(78)
South	0.9x	0.77	X	5.44		x	110.23	X	0.4	X	0.7	=	116.36	(78)
South	0.9x	0.77	X	4.8		x	110.23	X	0.4	x	0.7	=	102.67	(78)
South	0.9x	0.77	X	5.44		x	114.87	X	0.4	X	0.7	=	121.26	(78)
South	0.9x	0.77	X	4.8		x	114.87	X	0.4	X	0.7	=	106.99	(78)
South	0.9x	0.77	X	5.44		x	110.55	X	0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77	X	4.8		x	110.55	x	0.4	x	0.7	=	102.96	(78)
South	0.9x	0.77	X	5.44		x	108.01	x	0.4	x	0.7	=	114.01	(78)
South	0.9x	0.77	X	4.8		x	108.01	X	0.4	x	0.7	=	100.6	(78)
South	0.9x	0.77	X	5.44		x	104.89	x	0.4	x	0.7	=	110.72	(78)
South	0.9x	0.77	x	4.8		x	104.89	x	0.4	x	0.7	=	97.7	(78)
South	0.9x	0.77	x	5.44		x	101.89	x	0.4	x	0.7	=	107.55	(78)
South	0.9x	0.77	x	4.8		x [101.89	x	0.4	x	0.7	=	94.9	(78)
South	0.9x	0.77	x	5.44		x [82.59	Х	0.4	Х	0.7	=	87.18	(78)
South	0.9x	0.77	×	4.8	=	x	82.59	х	0.4	х	0.7	=	76.92	(78)
South	0.9x	0.77	×	5.44		х	55.42	×	0.4	х	0.7	=	58.5	(78)
South	0.9x	0.77	x	4.8		x	55.42	x	0.4	х	0.7	=	51.62	(78)
South	0.9x	0.77	×	5.44		x [40.4	х	0.4	x	0.7	-	42.64	(78)
South	0.9x	0.77	X	4.8	7	x	40.4	X	0.4	х	0.7	=	37.63	(78)
West	0.9x	0.77	x	1.44	1	х	19.64	x	0.4	х	0.7	=	5.49	(80)
West	0.9x	0.77	x	1.44		х	38.42	x	0.4	x	0.7	=	10.74	(80)
West	0.9x	0.77	x	1.44		x	63.27	x	0.4	x	0.7		17.68	(80)
West	0.9x	0.77	X	1.44		x	92.28	x	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	x	1.44		x	113.09	x	0.4	×	0.7		31.6	(80)
West	0.9x	0.77	x	1.44		x	115.77	x	0.4	x	0.7		32.35	(80)
West	0.9x	0.77	x	1.44		x	110.22	x	0.4	x	0.7		30.8	(80)
West	0.9x	0.77	x	1.44		x	94.68	x	0.4	x	0.7	=	26.45	(80)
West	0.9x	0.77	x	1.44		х	73.59	x	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	x	1.44		x [45.59	x	0.4	x	0.7	=	12.74	(80)
West	0.9x	0.77	×	1.44		x [24.49	x	0.4	×	0.7	_ =	6.84	(80)
West	0.9x	0.77	×	1.44		х	16.15	x	0.4	×	0.7		4.51	(80)
						_		•						
Solar g	ains in	watts, cal	culated	for each	month			(83)m	ı = Sum(74)m	(82)m				
(83)m=	98.38	162.87	211.48	244.82	259.85	2	245.41	234	.88 223.01	176.83	116.95	84.78		(83)
Total ga	ains – i	nternal an	d solar	(84)m =	(73)m ·	+ (8	3)m , watts							
(84)m=	483.97	546.46	583.01	597.03	592.6	56	5.95 547.11	542	.17 540.21	513.55	476.04	460.5		(84)
7. Mea	an inter	nal tempe	erature	(heating s	season)								
							area from Tab	ole 9	Th1 (°C)				21	(85)
•		•	٠.			-	e Table 9a)							
ſ	Jan	Feb	Mar	Apr	May	È	Jun Jul	А	ug Sep	Oct	Nov	Dec		
01	OAD 004	12 Varaian: 1	0.5.54 /	-	In 11 11	•		•		•		•		5 of 7

(86)m=	0.99	0.99	0.98	0.94	0.86	0.69	0.51	0.54	0.76	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	20.07	20.22	20.42	20.66	20.86	20.97	21	20.99	20.95	20.71	20.35	20.05		(87)
Tempe	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.08	20.08	20.08	20.1	20.1	20.11	20.11	20.12	20.11	20.1	20.09	20.09		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)					'	
(89)m=	0.99	0.99	0.97	0.92	0.82	0.61	0.41	0.44	0.69	0.92	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to 1	7 in Tabl	le 9c)			l	
(90)m=	18.85	19.07	19.36	19.7	19.96	20.09	20.11	20.11	20.07	19.78	19.27	18.82		(90)
				Į.		Į.	Į.	Į.	1	fLA = Livin	g area ÷ (4) =	0.41	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fl	A) x T2					
(92)m=	19.35	19.54	19.79	20.09	20.33	20.45	20.47	20.47	20.43	20.16	19.71	19.32		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	ļ			
(93)m=	19.35	19.54	19.79	20.09	20.33	20.45	20.47	20.47	20.43	20.16	19.71	19.32		(93)
8. Spa	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	ıt Ti,m=(76)m an	d re-calc	ulate	
the uti			or gains			live	11	A	Can	Oct	Nav	Doo		
L Litilisa	Jan tion fac	Feb	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.98	0.97	0.92	0.83	0.65	0.45	0.48	0.72	0.92	0.98	0.99		(94)
L	l gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	479.93	537.31	563.24	552.12	492.69	365.13	248.72	260.28	387.24	473.6	467.42	457.5		(95)
Month	ly aver	age exte	rnal tem	perature	from T	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Г		r —	1	T		ı	=[(39)m :			r –			<u> </u>	(07)
` ' L	1013.82		889.74	737.57	566.46	378.05	250.18	262.28	411.46	627.84	833.51	1006		(97)
Space (98)m=	397.22	g require 299.49	242.92	133.53	54.89	/vn/mon	th = 0.02	24 X [(97])m – (95 0	114.75	263.58	408.09		
(00)111=	001.22	200.40	242.02	100.00	04.00					(kWh/year	l		1914.46	(98)
Space	hootin	a roquir	omant in	I/\/\/b/m2	2/voor			7010	ii poi youi	(ittiii) youi) = Ca m(c	0)15,912		_
•		•	ement in										28.57	(99)
						scheme		lina nua.	يرجا لمحامات					
							ater heat heating (unity Scr	ieme.	0	(301)
	•			•		1 – (30	_	`	,				1	(302)
	•			•	•	,	,	allows for	CUD and	un to four	other heat	oouroos: f		(002)
	-						r stations.			up to rour (otner neat	sources; ti	ie ialler	
Fraction	n of hea	at from C	Commun	ity boiler	'S								1	(303a)
Fraction	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor f	for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
					,	` ''	ng syste	•	0 ,				1.05	(306)
			, , abio	0, 101 (, 1100111	5,510							
Space Annual		_	requiren	nent									kWh/ye 1914.46	аг
,aai	Space	oamig	. 54411011										1314.40	

Space heat from Community boilers	(98) x (304a)	x (305) x (306) =	2010.19	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Appe	endix E)	0	(308)
Space heating requirement from secondary/supplement	tary system (98) x (301) x	x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1791.08]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a)	x (305) x (306) =	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(3	.07e) + (310a)(310e)] =	38.91	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	enter 0) = (107) ÷ (31	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in	119.54	(330a)		
warm air heating system fans	0	(330b)		
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	119.54	(331)
Energy for lighting (calculated in Appendix L)			315.44	(332)
Total delivered energy for all uses (307) + (309) + (310)	+ (312) + (315) + (331) + (332) (237h) =	4325.81	(338)
	(0.2) (0.0) (001) (002)(2015) =		
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (no lifthere is	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (no	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	Energy kWh/year of CHP) CHP using two fuels repeat (363)	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 =	Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 =	Emissions kg CO2/year 95 884.65 20.19 904.84	(367a) (367) (372)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 372) = 0 =	Emissions kg CO2/year 95 884.65 20.19 904.84	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52	Emissions kg CO2/year 95 884.65 20.19 904.84	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or incommunity.	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52	Emissions kg CO2/year 95 884.65 20.19 904.84 0 904.84	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or intotal CO2 associated with space and water heating	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22	Emissions kg CO2/year 95 884.65 20.19 904.84 0 904.84 62.04	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) = in dwelling (331)) x (332))) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	Emissions kg CO2/year 95 884.65 20.19 904.84 0 904.84 62.04	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with CO2 associated with electricity for lighting	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) = in dwelling (331)) x (332))) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	## Page 16	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 4 (Bottom) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3 (2a) = (3a) 67 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) total main secondary other m³ per hour heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) 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) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjusted infiltr	ation rate	e (allowii	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	0.27	0.3	0.32	0.33	0.35		
Calculate effe		_	rate for t	he appli	cable ca	se			!		!	•	1,00
If mechanic			ndiv N. (2	2h) _ (22a) Em. (a	auation (N	JEN otho	auioo (22h) - (22a)			0	(23a)
If exhaust air h) = (23a)			0	(23b)
									21.) (001) [4 (00.)	0	(23c)
a) If balance								<u> </u>	, 		<u>`</u>	÷ 100] I	(24a)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ea mecha 0	anicai ve		without	neat red	overy (N	//V) (24b	0 m = (22)	$\frac{26)m + (2)}{0}$	23b) 0		1	(24b)
(24b)m= 0			0							0	0		(240)
c) If whole h	nouse ext n < 0.5 ×			•	•				5 v (23h)			
(24c)m = 0	0.0 1	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	لــــــــــــــــــــــــــــــــــــــ	n or wh	ole hous	e nositiv	/e innut	ventilatio	n from l	oft.					` '
,	n = 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)
Effective air	change	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) 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 losse	e and he	at lose r	aramoto	or.									_
ELEMENT	Gros		Openin		Net Ar	ea	U-vali	IE.	AXU		k-value	<u></u>	ΑΧk
	area		m		A ,r		W/m2		(W/I	K)	kJ/m ² ·l		kJ/K
Doors					2.4	х	1	=	2.4				(26)
Windows Type	e 1				1.44	x1,	/[1/(1.4)+	0.04] =	1.91	П			(27)
Windows Type	e 2				5.44	x1,	/[1/(1.4)+	0.04] =	7.21	П			(27)
Windows Type	e 3				4.8	x1,	/[1/(1.4)+	0.04] =	6.36	5			(27)
Floor					67	x	0.13		8.71	= [(28)
Walls Type1	31.7	7	10.24	4	21.46	x	0.18	=	3.86	F i		7 7	(29)
Walls Type2	19	=	1.44	=	17.56	=	0.18	= :	3.16	=		7	(29)
Walls Type3	11.1	_	2.4	=	8.7	X	0.18	=	1.57	=		-	(29)
Walls Type4	2.4		0	=	2.4	x	0.18	=	0.43	룩 ;		3	(29)
Total area of e	L				131.2	=	0.10		0.40				(31)
* for windows and			ffective wi	ndow U-va			ı formula 1	/[(1/U-valı	ue)+0.041 a	as aiven in	paragraph	3.2	(31)
** include the are						atou uomg	romaia i	I mo vale	10) 10.0 13 0	io givoii iii	paragrapi	. 0.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				35.6	2 (33)
Heat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5726	68 (34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses can be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cald	culated u	using Ap	pendix ł	<						6.56	(36)
if details of therm. Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			42.1	8 (37)
Ventilation he		alculated	monthly	/					= 0.33 × (25)m x (5))	74.1	<u> </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	~ _		-l-,			L				L		l	

	()
(38)m= 37.92 37.74 37.56 36.71 36.55 35.81 35.81 35.67 36.09 36.55 36.87 37.21	(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
(39)m= 80.1 79.91 79.73 78.88 78.72 77.98 77.98 77.85 78.27 78.72 79.05 79.38	(20)
Average = $Sum(39)_{112}/12 = 78.88$ Heat loss parameter (HLP), W/m ² K (40)m = $(39)m \div (4)$	(39)
(40)m= 1.2 1.19 1.18 1.17 1.16 1.16 1.16 1.17 1.17 1.18 1.18	
Average = $Sum(40)_{112}/12=$ 1.18 Number of days in month (Table 1a)	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.17	(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)	
(44)m= 94.34 90.91 87.48 84.05 80.62 77.19 77.19 80.62 84.05 87.48 90.91 94.34	
Total = Sum(44) ₁₋₁₂ = 1029.1	18 (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= 139.91 122.36 126.27 110.08 105.63 91.15 84.46 96.92 98.08 114.3 124.77 135.49	
Total = Sum(45) ₁₁₂ = 1349.4 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)
	(46)
(46)m= 20.99 18.35 18.94 16.51 15.84 13.67 12.67 14.54 14.71 17.15 18.72 20.32 Water storage loss:	(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$	(50)
b) If manufacturer's declared cylinder loss factor is not known:	(55)
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52) (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)

Primary circuit loss (annual) fro						(0		(58)
Primary circuit loss calculated for	,	, ,	, , ,		thormo	otot)			
(modified by factor from Table (59)m= 23.26 21.01 23.26	22.51 23.26		23.26 23.26	22.51	23.26	22.51	23.26		(59)
` '									, ,
Combi loss calculated for each (61)m= 0 0 0	$\frac{\text{month } (61)\text{m} = (61)\text{m}}{0} = (61)\text{m}$	60) ÷ 365	× (41)m	0	0	0	0		(61)
Total heat required for water he								(F0)m + (G1)m	
(62)m= 186.5 164.45 172.86	155.17 152.22		131.06 143.52	143.17	160.9	169.86	182.09	(59)111 + (61)111	(62)
Solar DHW input calculated using Appe			!						(02)
(add additional lines if FGHRS					Contributi	on to wate	i ricating)		
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0 0	0	0	0	0		(63) (G2
Output from water heater									
(64)m= 186.5 164.45 172.86	155.17 152.22	136.24 1	131.06 143.52	143.17	160.9	169.86	182.09		
			Outp	out from wa	iter heater	(annual) _{1.}	12	1898.03	(64)
Heat gains from water heating,	kWh/month 0.25	5 ´ [0.85 ×	(45)m + (61)m	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	_
(65)m= 83.79 74.35 79.26	72.68 72.4	-	65.36 69.5	68.68	75.28	77.56	82.33	-	(65)
include (57)m in calculation of	of (65)m only if cy	/linder is i	n the dwelling	or hot wa	ater is fr	om com	munity h	eating	
5. Internal gains (see Table 5							·		
Metabolic gains (Table 5), Watt									
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56	108.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	pendix L, equation	on L9 or L	9a), also see	Table 5					
(67)m= 17.41 15.46 12.58	9.52 7.12	6.01	6.49 8.44	11.33	14.38	16.79	17.89		(67)
Appliances gains (calculated in	Appendix L, equ	uation L13	or L13a), also	see Tab	ole 5				
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 1	142.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	pendix L, equati	on L15 or	· L15a), also se	ee Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86	33.86 33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	ia)	•	•	•					
(70)m= 3 3 3	3 3	3	3 3	3	3	3	3		(70)
Losses e.g. evaporation (negat	ive values) (Tabl	e 5)	•	•					
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -	-86.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)	-	-	-						
(72)m= 112.63 110.65 106.53	100.94 97.31	92.19	87.85 93.42	95.4	101.18	107.72	110.65		(72)
Total internal gains =		(66)m	+ (67)m + (68)m -	+ (69)m + (7	70)m + (7	1)m + (72)	m		
(73)m= 378.8 376.85 364.87	345.64 326.23	307.45	295.2 300.74	310.58	330.01	352.32	368.92		(73)
6. Solar gains:									
Solar gains are calculated using solar			ed equations to co	nvert to the	e applicab		ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table	e 6a T	g_ able 6b	Ta	FF able 6c		Gains (W)	
South 0.9x 0.77 x	5.44	x 46.7	75 X	0.63	_ x _	0.7	=	77.73	(78)

	_					_		_						
South	0.9x	0.77		X	4.8	X	46.75	×	0.63	X	0.7	=	68.58	(78)
South	0.9x	0.77		X	5.44	X	76.57	X	0.63	X	0.7	=	127.3	(78)
South	0.9x	0.77		X	4.8	X	76.57	X	0.63	X	0.7	=	112.32	(78)
South	0.9x	0.77		x	5.44	x	97.53	X	0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77		x	4.8	x	97.53	×	0.63	x	0.7	=	143.08	(78)
South	0.9x	0.77		x	5.44	x	110.23	X	0.63	x	0.7	=	183.27	(78)
South	0.9x	0.77		x	4.8	x	110.23	X	0.63	×	0.7	=	161.71	(78)
South	0.9x	0.77		X	5.44	X	114.87	×	0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77		X	4.8	X	114.87	X	0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77		X	5.44	X	110.55	×	0.63	x	0.7	=	183.79	(78)
South	0.9x	0.77		x	4.8	x	110.55	×	0.63	×	0.7	=	162.17	(78)
South	0.9x	0.77		X	5.44	X	108.01	X	0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77		x	4.8	x	108.01	×	0.63	x	0.7	=	158.45	(78)
South	0.9x	0.77		x	5.44	X	104.89	X	0.63	x	0.7	=	174.39	(78)
South	0.9x	0.77		x	4.8	x	104.89	X	0.63	x	0.7	=	153.87	(78)
South	0.9x	0.77		x	5.44	x	101.89	×	0.63	x	0.7	=	169.39	(78)
South	0.9x	0.77		x	4.8	x	101.89	×	0.63	x [0.7	=	149.46	(78)
South	0.9x	0.77		X	5.44	X	82.59	×	0.63	Х	0.7	=	137.3	(78)
South	0.9x	0.77		x	4.8	х	82.59	x	0.63	х	0.7	=	121.15	(78)
South	0.9x	0.77		x	5.44	х	55.42] ×	0.63	х	0.7	=	92.13	(78)
South	0.9x	0.77		x	4.8	x	55.42	x	0.63	х	0.7	=	81.29	(78)
South	0.9x	0.77		x	5.44	x	40.4	X	0.63	х	0.7	=	67.16	(78)
South	0.9x	0.77		x	4.8	x	40.4	X	0.63	х	0.7	=	59.26	(78)
West	0.9x	0.77		x	1.44	x	19.64	X	0.63	х	0.7	=	8.64	(80)
West	0.9x	0.77		x	1.44	x	38.42	X	0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77		x	1.44	x	63.27	X	0.63	X	0.7	=	27.85	(80)
West	0.9x	0.77		x	1.44	x	92.28	X	0.63	×	0.7	=	40.61	(80)
West	0.9x	0.77		x	1.44	x	113.09	X	0.63	x	0.7	=	49.77	(80)
West	0.9x	0.77		x	1.44	x	115.77	X	0.63	x	0.7	=	50.95	(80)
West	0.9x	0.77		x	1.44	x	110.22	X	0.63	×	0.7	=	48.51	(80)
West	0.9x	0.77		x	1.44	x	94.68	×	0.63	x	0.7	=	41.67	(80)
West	0.9x	0.77		x	1.44	x	73.59	×	0.63	x	0.7	=	32.39	(80)
West	0.9x	0.77		x	1.44	x	45.59	×	0.63	x	0.7	=	20.06	(80)
West	0.9x	0.77		x	1.44	x	24.49	X	0.63	x [0.7	=	10.78	(80)
West	0.9x	0.77		x	1.44	x	16.15	×	0.63	x	0.7	=	7.11	(80)
Ť				$\overline{}$	for each mon			_	n = Sum(74)m				Ī	
` ′ L	154.95	256.53	333.0		385.59 409.2		96.91 386.53	369	.93 351.23	278.51	184.2	133.53		(83)
т					$\frac{(84)m = (73)r}{734.00}$	<u> </u>		1	a a	l aaa -		F.c. :-	Ī	(0.4)
(84)m=	533.75	633.37	697.	95	731.22 735.4	9 7	04.36 681.72	670	.67 661.81	608.52	536.52	502.45		(84)
				•	heating seas									
-		_			eriods in the li	_			, Th1 (°C)				21	(85)
Utilisat				$\overline{}$	ving area, h1	Ť			<u> </u>	1	1	1	1	
L	Jan	Feb	Ma	ar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
04	0 4 D 004	0 \ / '	405	-4 (0	AD 0.02) http://	/							D	5 of 7

						•					•	•	ı	
(86)m=	0.99	0.98	0.96	0.92	0.83	0.67	0.49	0.52	0.74	0.93	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.88	20.08	20.33	20.61	20.83	20.96	20.99	20.99	20.93	20.65	20.2	19.84		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.92	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.94	19.93		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling,	h2,m (se	e Table	9a)					'	
(89)m=	0.99	0.98	0.95	0.9	0.78	0.57	0.38	0.41	0.65	0.9	0.98	0.99		(89)
Mean	interna	l temner	ature in	the rest	of dwelli	na T2 (fa	allow ste	ns 3 to	7 in Tabl	e 9c)			l	
(90)m=	18.45	18.74	19.1	19.5	19.78	19.92	19.95	19.95	19.89	19.56	18.94	18.4		(90)
` ,									f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Moon	intorno	ltompor	oturo (fo	r tha wh	مام طبیره	llina\ fl	Λ., Τ1	. /4 fl	Λ) Το					
(92)m=	19.03	19.29	ature (fo	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(92)
									ere appro		10.40	10.00		(5-)
(93)m=	19.03	19.29	19.6	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(93)
	ace hea	ting requ	uirement											
•		•			e obtain	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a				· · · · · ·					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm											(0.4)
(94)m=	0.99	0.97	0.95	0.9	0.79	0.61	0.43	0.46	0.68	0.9	0.98	0.99		(94)
(95)m=		617,4	W = (94)	4)M X (84 654.69	581.4	429.59	291.61	305.62	453.17	548.67	523.48	497.96		(95)
			rnal tem				291.01	303.02	455.17	340.07	323.40	497.90		(33)
(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)
									L – (96)m					, ,
	1180.11		1044.63	871.6	669.77	447.95	294.18	309.17	486.44	740.03	976.5	1173.88		(97)
Space	e heatin	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=	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2320.89	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								34.64	(99)
9a. En	erav rec	ıuiremer	nts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	CHP)					
	e heatir					,	3		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
•		_	at from se	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	-	•	ry/supple			a svstem	າ. %						0	(208)
	•							۸۰۰۵	Con	Oct	Nov	Doo		`
Snac	Jan e heatin	Feb a require	Mar ement (c	Apr alculate	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	yeai
Opaci	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
(211)m			(4)] } x 1						-					(211)
(411)11	519.24	382.55	304.14	167.03	70.32	0	0	0	0	152.27	348.85	537.84		(211)
	·	32.00	I	31.00					l (kWh/yea				2482.24	(211)
									•	·	10,1012			` ′

Space heating fuel (secondary), kWh/month								
$= \{[(98)m \times (201)]\} \times 100 \div (208)$								
(215)m= 0 0 0 0 0	0 0		0	0	0	0		_
		Tota	al (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating								
Output from water heater (calculated above) 186.5 164.45 172.86 155.17 152.22 1	136.24 131.	.06 143.52	143.17	160.9	169.86	182.09		
Efficiency of water heater	130.24 131.	143.52	143.17	160.9	109.00	162.09	70.0	(216)
	79.8 79.	8 79.8	79.8	84.49	86.53	87.39	79.8	(217)
` '	79.6 79.	0 79.0	79.6	04.49	00.33	07.39		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
	170.73 164	23 179.84	179.41	190.43	196.31	208.37		
	•	Tota	al = Sum(2	19a) ₁₁₂ =			2260.02	(219)
Annual totals				k\	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							2482.24	
Water heating fuel used							2260.02	
Electricity for pumps, fans and electric keep-hot						'		_
central heating pump:						30		(230c)
boi <mark>ler with a fan-assisted flue</mark>						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							307.48	(232)
Total delivered energy for all uses (211)(221) +	(231) + (23	32)(23 7 b)	=				5124.74	(338)
12a. CO2 emissions – Individual heating system	ns including	micro-CHF	2					<u> </u>
	kWh/ye			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	536.16	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	488.16	(264)
Space and water heating	(261) + (2	62) + (263) +	(264) =				1024.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	159.58	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1222.83	(272)

TER =

(273)

18.25

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height:

67 m² Floor 0 3 m

27.5 m² (fraction 0.41) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
DOOR	Manufacturer	Solid			Wood
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
Ralcony	Manufacturer	Windows	low-E En - 0.05 soft coat	No	

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Type-Name: Location: Width: Height: Name: Orient: Worst case **DOOR** INT 0 Ε East 0 0 Balcony Ε East 0

More than average Overshading:

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elements	<u>S</u>						
E	29.4	8.96	20.44	0.15	0	False	N/A
INT	12	2.4	9.6	0.16	0.43	False	N/A
Spandrel	2.44	0	2.44	0.35	0	False	N/A
Exposed	67			0.11			N/A
Internal Elements	6						

Party Elements

Thermal bridges:

No information on thermal bridging (y=0.15) (y=0.15)

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system:

Water heating:

Water heating:

None

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 5 (Bottom) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3 (2a) = (3a) 67 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) total main secondary other m³ per hour heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

0.15	0.15	e (allowi	0.13	0.12	0.11	0.11	(21a) x	(22a)m 0.12	0.12	0.13	0.14		
Calculate effe		••••		_	l -	_	0.11	0.12	0.12	0.13	0.14		
If mechanica	al ventila	ition:									[0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		[0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	Table 4h) =			[79.05	(23
a) If balance	ed mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (23b) × [1 - (23c)	÷ 100]	
(24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r				•	re input v o); otherv				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r				•	e input verwise (2				0.5]		-		
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(25
3. Heat losse	c and he	at loce i	o aramote	or.								_	
ELEMENT	Gros		Openin		Net Ar	ea	U-valu	IE.	AXU		k-value	Δ	Χk
	area		m		A ,n		W/m2		(W/I	<)	kJ/m²-k		J/K
Doo <mark>rs</mark>					2.4	х	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	e 1				4.16	x .	1/[1/(1)+	0.04] =	4				(27
Windows Type	2				4.8	x .	1/[1/(1)+	0.04] =	4.62				(27
loor					67	X	0.11	=	7.37	٦ [¬	(28
Walls Type1	29.4	4	8.96		20.44	. x	0.15	=	3.07			$\bar{1}$	(29
Walls Type2	12		2.4		9.6	X	0.15	=	1.44			ī	(29
Walls Type3	2.4	4	0		2.44	x	0.35	<u> </u>	0.85	T i		ī	(29
Total area of e	lements	, m²			110.8	4							(31
for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	re)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and pan	titions		(2.2)	(22)			-		
abric heat los	·	•	U)				(26)(30)	` '			Į	24.7	(33
Heat capacity		,						***	.(30) + (32)	, , ,	(32e) = [5479.72	(34
hermal mass	•	•		•					tive Value			250	(3
For design assess an be used inste				construct	ion are not	known pr	ecisely the	ndicative	values of	IMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix k	<					Г	16.63	(30
f details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he	at loss							(33) +	(36) =		[41.33	(3
otal labile lie	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)) -		
/entilation hea		I 1.104	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	Feb	Mar	Αρι	iviay			†				1		
/entilation hea	Feb 16.59	16.39	15.43	15.24	14.27	14.27	14.08	14.66	15.24	15.62	16.01		(38
/entilation hea	16.59	16.39				14.27	14.08		15.24 = (37) + (3		16.01		(38

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.83	0.84	0.84	0.85	0.86		
	!					!			Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day	1	1 ` ` 	<u> </u>						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		17		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed i			se target o		5.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x			!				
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
										ım(44) ₁₁₂ =		1029.18	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,ı	m x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous w	vater heati	ing at point	of use (no	hot water	storage)	enter () in	hoxes (46		Total = Su	ım(45) ₁₁₂ =		1349.41	(45)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage		10.94	10.51	15.04	13.07	12.07	14.54	14.71	17.13	10.72	20.32		(40)
Storage volum	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		الممسمام	ft-	ممادات	/1.\^/1	- /-l -> -\ .							(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage		1			Ι		. , ,	(55) × (41)	ı				(=0)
(56)m= 32.01 If cylinder contains	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	Sv. LT	(56)
				· · ·					ını where (,HII) IS IIO		хп	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	`	,									0		(58)
Primary circuit				,	•		, ,		(1.	-1-1			
(modified by			ı —	ı —	ı —			<u> </u>		- 	00.00		(EO)
(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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	n month	(62)n	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.18	172.29	181.54	163.58	160.9	144.64	139.74	152.	2 151.57	169.58	178.26	190.77		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribu	tion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	18.03	16.04	16.49	14.58	14.03	12.18	11.28	12.9	4 13.08	15.09	16.32	17.54		(63) (G2)
Output	t from wa	ater hea	ter										_	
(64)m=	174.47	153.83	162.37	146.4	144.19	129.86	125.78	136.	58 135.89	151.81	159.35	170.55		_
								C	Output from w	ater heate	er (annual)	112	1791.08	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	90.74	80.63	86.21	79.4	79.34	73.1	72.31	76.4	5 75.41	82.23	84.28	89.27		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelli	ng or hot w	vater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.5	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	n <mark>g g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	^r L9a), a	lso se	e Table 5					
(67)m=	18.93	16.81	13.67	10.35	7.74	6.53	7.06	9.17	12.31	15.63	18.25	19.45		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble <mark>5</mark>				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.3	32 145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)), alsc	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.8	6 33.86	33.86	33.86	33.86		(69)
Pumps	s and far	ns gains	(Table 5	āa)									_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					_		_	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.8	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	121.96	119.98	115.87	110.27	106.64	101.53	97.18	102.7	75 104.73	110.52	117.06	119.99		(72)
Total i	internal	gains =	1			(66)	m + (67)m	ı + (68)	m + (69)m +	(70)m + (7	71)m + (72))m		
(73)m=	386.65	384.53	372.3	352.8	333.19	314.31	302.1	307.8	317.9	337.6	360.11	376.81		(73)
6. So	lar gains	S:												
	-		•	r flux from	Table 6a		-	tions to	convert to the	he applica		tion.		
Orient	ation: A	Access F Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	T	FF able 6c		Gains (W)	
East	0.9x	0.77	X	4.1	6	x 1	9.64	x	0.4	x	0.7	=	15.85	(76)
East	0.9x	0.77	x	4.	8	x 1	9.64	х	0.4	×	0.7	<u> </u>	18.29	(76)
East	0.9x	0.77	x	4.1	6	x 3	8.42	x	0.4	x [0.7	=	31.01	(76)
East	0.9x	0.77	х	4.	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(76)
	<u>L</u>		•											_

	г		_						1		_				_
East	0.9x	0.77	×	4.1	16	X	6	3.27	X	0.4	×	0.7	=	51.07	(76)
East	0.9x	0.77	X	4.	8	X	6	3.27	X	0.4	X	0.7	=	58.93	(76)
East	0.9x	0.77	X	4.1	16	X	9	2.28	X	0.4	X	0.7	=	74.49	(76)
East	0.9x	0.77	X	4.	8	X	9	2.28	X	0.4	X	0.7	=	85.95	(76)
East	0.9x	0.77	X	4.1	16	X	1	13.09	X	0.4	X	0.7	=	91.29	(76)
East	0.9x	0.77	X	4.	8	X	1	13.09	X	0.4	X	0.7	=	105.33	(76)
East	0.9x	0.77	X	4.1	16	X	1	15.77	X	0.4	X	0.7	=	93.45	(76)
East	0.9x	0.77	X	4.	8	X	1	15.77	X	0.4	×	0.7	=	107.83	(76)
East	0.9x	0.77	X	4.1	16	X	1	10.22	X	0.4	X	0.7	=	88.97	(76)
East	0.9x	0.77	X	4.	8	X	1	10.22	X	0.4	X	0.7	=	102.66	(76)
East	0.9x	0.77	X	4.1	16	X	9	4.68	x	0.4	X	0.7	=	76.42	(76)
East	0.9x	0.77	X	4.	8	X	9	4.68	X	0.4	X	0.7	=	88.18	(76)
East	0.9x	0.77	X	4.1	16	X	7	3.59	X	0.4	X	0.7	=	59.4	(76)
East	0.9x	0.77	X	4.	8	X	7	3.59	X	0.4	X	0.7	=	68.54	(76)
East	0.9x	0.77	X	4.1	16	X	4	5.59	X	0.4	X	0.7	=	36.8	(76)
East	0.9x	0.77	X	4.	8	X	4	5.59	X	0.4	×	0.7	=	42.46	(76)
East	0.9x	0.77	X	4.1	16	X	2	4.49	X	0.4	X	0.7	=	19.77	(76)
East	0.9x	0.77	X	4.	8	X	2	4.49	X	0.4	X	0.7	=	22.81	(76)
East	0.9x	0.77	X	4.1	16	х	1	6.15	x	0.4	×	0.7	=	13.04	(76)
East	0.9x	0.77	x	4.	8	х	1	6.15] x	0.4	×	0.7	=	15.04	(76)
			ш						7						
Sola <mark>r g</mark>	ains in	watts, calcu	lated	for eac	h month	1			(83)m	n = Sum(74)m.	(<mark>8</mark> 2)m				
											_		1	7	
(83)m=	<mark>3</mark> 4.15		0.01	160.44	196.62		01.28	191.63	164	1.6 127.94	79.26	42.58	28.08		(83)
Total g	ains – i	nternal and	solar	(84)m =	= (73)m	+ (8	33)m	watts	I				1		, ,
` ' L		nternal and				+ (8			16 ⁴		79.26 416.8		28.08]	(83)
Total g	ains – i 420.8	nternal and	solar 32.31	(84)m = 513.24	= (73)m 529.81	+ (8	33)m	watts	I				1		, ,
Total ga (84)m=	ains – i 420.8 an inter	nternal and 451.33 48	solar 32.31 ature	(84)m = 513.24 (heating	529.81 season	+ (8	8 3) m 15.59	watts 493.72	472	.41 445.84			1	21	, ,
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature	nternal and 451.33 48 nal tempera	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in	= (73)m 529.81 season the liv	+ (8	33)m 15.59 area f	watts 493.72 from Tak	472	.41 445.84			1	21	(84)
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature	nternal and 451.33 48 nal temperator during heat	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in	= (73)m 529.81 season the liv	+ (8	33)m 15.59 area f	watts 493.72 from Tak	472 ole 9	.41 445.84		6 402.69	1	21	(84)
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature tion fac	nternal and 451.33 48 rnal temperal during heat ctor for gains	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in iving are	529.81 season the livea, h1,n	+ (8	33)m 15.59 area f ee Ta	watts 493.72 From Tab ble 9a)	472 ole 9	.41 445.84 , Th1 (°C)	416.8	6 402.69	404.89	21	(84)
Total graph (84)m= [7. Mean Temporal Utilisan (86)m= [ains – i 420.8 an inter erature ation fact Jan 1	nternal and 451.33 48 rnal temperal during heat ctor for gains	solar 32.31 ature ting p s for l Mar	(84)m = 513.24 (heating eriods in iving are Apr 0.96	529.81 season the liv ea, h1,n May	+ (8	33)m 15.59 area f ee Ta Jun 0.67	rom Tab ble 9a) Jul 0.49	472 ole 9,	.41 445.84 , Th1 (°C) ug Sep	416.8 Oc	6 402.69	404.89 Dec	21	(84)
Total graph (84)m= [7. Mean Temporal Utilisan (86)m= [ains – i 420.8 an inter erature ation fact Jan 1	nternal and 451.33 48 nal temperator for gains Feb I 0.99 0	solar 32.31 ature ting p s for l Mar	(84)m = 513.24 (heating eriods in iving are Apr 0.96	529.81 season the liv ea, h1,n May	+ (8	33)m 15.59 area f ee Ta Jun 0.67	rom Tab ble 9a) Jul 0.49	472 ole 9,	.41 445.84 , Th1 (°C) ug Sep 54 0.8	416.8 Oc	6 402.69 t Nov 0.99	404.89 Dec	21	(84)
Total graph (84)m= [7. Metalogous Temporal Utilisa (86)m= [Mean (87)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19	nternal and 451.33 48 nal temperator for gains Feb I 0.99 0	solar 32.31 ature ting p s for l Mar 0.99 re in l	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f	+ (% 5·	area f ee Ta Jun 0.67 w ste	493.72 From Table 9a) Jul 0.49 ps 3 to 7	472 ole 9 0.5	.41 445.84 , Th1 (°C) ug Sep .64 0.8 .7able 9c) 1 20.95	Oc: 0.97	6 402.69 t Nov 0.99	404.89 Dec 1	21	(84)
Total graph (84)m= [7. Metalogous Temporal Utilisa (86)m= [Mean (87)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19	nternal and 451.33 48 nal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat	solar 32.31 ature ting p s for l Mar 0.99 re in l	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f	+ (8 5 5 or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or	area f ee Ta Jun 0.67 w ste	493.72 From Table 9a) Jul 0.49 ps 3 to 7	472 ole 9 0.5	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95 9, Th2 (°C)	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	404.89 Dec 1	21	(84)
Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m=	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2	temperature 20.29 20.22 2	solar 32.31 ature ting p s for l Mar 0.99 re in l 0.47 ting p	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21	529.81 Season the livea, h1,n May 0.86 ea T1 (frace 20.9) rest of 20.22	+ (8 5 5 n) iing m (see follo 2 2 f dw	area free Ta Jun 0.67 w stee 0.98 relling	watts 493.72 From Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23	472 A 0.57 in T 2 able 9	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95 9, Th2 (°C)	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17	21]	(84) (85) (86) (87)
Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m=	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2	nternal and 451.33 48 nal temperate during heat stor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2	solar 32.31 ature ting p s for l Mar 0.99 re in l 0.47 ting p	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21	529.81 Season the livea, h1,n May 0.86 ea T1 (frace 20.9) rest of 20.22	+ (8 5 5 n) n) ing (see 1	area free Ta Jun 0.67 w stee 0.98 relling	watts 493.72 From Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23	472 A 0.57 in T 2 able 9	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .D, Th2 (°C) .23 20.22	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17	21]	(84) (85) (86) (87)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1	nternal and 451.33 48 nal temperate during heat extor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 extor for gains 0.99 0	solar 32.31 ature ting p s for l Mar 0.99 re in 0.47 ting p 20.2	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of di 0.94	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 0.98 relling 0.23 m (se 0.6	rom Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41	472 All 0.5 All 0.5 7 in T 2 able 9 20. 9a) 0.4	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .9, Th2 (°C) .23 20.22	Oc 0.97 20.72 20.22	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17 20.21		(84) (85) (86) (87) (88)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m= Mean	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2 tion fac 1	nternal and 451.33 48 rnal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 ctor for gains 0.99 0 I temperatu	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21 eest of di 0.94 the rest	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area free Ta Jun 0.67 w stee 0.98 relling 0.63 m (see 0.6	rom Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23 ee Table 0.41 bllow ste	472 A 0.5 in T 2 able 9 0.4 0.5 20. 9a) 0.4	.41	Oc 0.97 20.72 20.22	6 402.69 t Nov 0.99 2 20.42 2 20.21	Dec 1 20.17 20.21]	(84) (85) (86) (87) (88)
Total graph (84)m= [7. Metalon (86)m= [Mean (87)m= [Tempor (88)m= [Utilisa (89)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1	nternal and 451.33 48 rnal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 ctor for gains 0.99 0 I temperatu	solar 32.31 ature ting p s for l Mar 0.99 re in 0.47 ting p 20.2	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of di 0.94	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 0.98 relling 0.23 m (se 0.6	rom Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41	472 All 0.5 All 0.5 7 in T 2 able 9 20. 9a) 0.4	.41 445.84 Th1 (°C) ug Sep i4 0.8 Table 9c) 1 20.95 9, Th2 (°C) 23 20.22 15 0.73 to 7 in Table 23 20.19	20.72 20.72 20.97 20.95 e 9c)	6 402.69 t Nov 0.99 2 20.42 2 20.21 0.99	Dec 1 20.17 20.21 1 19.09		(84) (85) (86) (87) (88) (89)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1 interna 19.1	nternal and 451.33 48 nal temperaturing heat extor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperature 19.25 19	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r 0.98 re in 1	(84) m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of d 0.94 the rest 19.87	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 20.98 m (se 0.6 T2 (fo	from Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41 bllow stee 20.23	472 Ai	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .9, Th2 (°C) .23 20.22 .5 0.73 .to 7 in Table .23 20.19	20.72 20.72 20.97 20.95 e 9c)	1 Nov 0.99 2 20.42 2 20.21 0.99	Dec 1 20.17 20.21 1 19.09	21	(84) (85) (86) (87) (88) (89)
Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1 interna 19.1 interna 19.1	nternal and 451.33 48 rnal temperate during heat extor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperatu 19.25 15 I temperatu	solar 32.31 ature ting p s for I Mar 0.99 re in 1 0.47 ting p 20.2 s for r 0.98 re in r 9.51	(84) m = 513.24 (heating eriods in iving are 20.71 eriods in 20.21 rest of do 0.94 the rest 19.87	(73)m 529.81 Season the livea, h1,n May 0.86 ea T1 (f 20.9 rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area free Ta Jun 0.67 w stee 0.98 relling 0.65 T2 (fo 0.22	ywatts 493.72 From Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41 bllow stee 20.23	472 AA 0.5 in T 2 able 9 0.4 ps 3 20. + (1	.41	Oc: 0.97 20.72 20.22 0.95 e 9c) 19.9 LA = Li	6 402.69 t Nov 0.99 2 20.42 2 20.21 0.99 19.46 ving area ÷ (1 20.17 20.21 1 19.09 4) =		(84) (85) (86) (87) (88) (89) (90) (91)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 tion factor 1 interna 19.1 interna 19.1	nternal and 451.33 48 nal temperaturing heat extor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperature 19.25 19 I temperature 19.67 1	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r 0.98 re in 1 9.51	(84) m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of d 0.94 the rest 19.87 r the wh	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 20.98 m (se 0.6 T2 (fo 20.22	watts 493.72 From Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 pe Table 0.41 bllow stee 20.23 A × T1 20.54	472 Ai	.41	Oc 0.97 20.72 20.22 0.95 e 9c) 19.9 LA = Li	1 Nov 0.99 2 20.42 2 20.21 0.99 19.46 2 19.85	Dec 1 20.17 20.21 1 19.09		(84) (85) (86) (87) (88) (89)

(00)		10.0	00.04	00.44	00.50	00.54	00.54	00.5		10.05	10.50		(93)
(93)m= 19.55 8. Space hea	19.67	19.9	20.21	20.44	20.53	20.54	20.54	20.5	20.24	19.85	19.53		(93)
Set Ti to the				e obtain	ed at ste	ep 11 of	Table 9b	o, so tha	t Ti.m=(76)m an	d re-calc	ulate	
the utilisation									, (
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	 -						i						
(94)m= 1	0.99	0.98	0.94	0.83	0.63	0.44	0.48	0.76	0.95	0.99	1		(94)
Useful gains,	1	`	<u> </u>		000.00	040.00	000.0	007.50	000.05	000.00	400.07		(OE)
(95)m= 418.82	447.64	473.1	483.44	442.06	323.33	218.68	228.6	337.53	396.95	398.63	403.37		(95)
Monthly aver (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										ļ	7.2		(00)
(97)m= 886.02	855.69	773.75	642.13	494.16	329.85	219.26	229.62	358.42	545.05	726.2	879.21		(97)
Space heatin	a require		r each m	nonth, k\		th = 0.02	24 x [(97)	L)m – (95		1)m	<u> </u>		
(98)m= 347.6	274.21	223.69	114.26	38.77	0	0	0	0	110.19	235.85	354.02		
	L						Tota	l per year	(kWh/yea	·) = Sum(9	8)15,912 =	1698.58	(98)
Space heatin	g require	ment in	kWh/m²	/year							[25.35	(99)
9b. Energy red	quirement	s – Cor	nmunity	heating	scheme						L		
This part is us	ed for spa	ace hea	ting, spa	ce cool	ng or wa	ater heat				unity sch	neme.		
Fraction of spa	ace heat f	rom se	condary/	supplen	nentary l	neating (Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat f	rom co	<mark>mmu</mark> nity	system	1 - (301	1) =						1	(302)
The c <mark>ommu</mark> nity se	cheme m <mark>ay</mark>	obtain he	eat from se	veral soul	ces. The p	procedure	allows for	CHP and t	up to four	other heat	sources; th	ne latter	
includes boilers, h					rom powei	r stations.	See Apper	ndix C.					7(2025)
Fraction of hea		7									Į	1	(303a)
Fraction of total	al space l	neat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for con	trol and c	harging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor (Table 1	2c) for c	ommun	ity heatir	ng syste	m					1.05	(306)
Space heating	g											kWh/yea	r
Annual space	heating re	equirem	nent									1698.58	
Space heat fro	om Comm	nunity b	oilers					(98) x (30	04a) x (30	5) x (306)	= [1783.51	(307a)
Efficiency of s	econdary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	requiren	nent froi	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =	Ī	0	(309)
Water heating	י										•		_
Annual water	•	quirem	ent									1791.08	7
If DHW from c	•												_
Water heat fro	m Comm	unity bo	oilers					(64) x (30	03a) x (30	5) x (306)	= [1880.63	(310a)
Electricity use	d for heat	distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	36.64	(313)
Cooling Syste	m Energy	Efficie	ncy Ratio)								0	(314)
Space cooling	(if there i	s a fixe	d coolin	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											r		_
mechanical ve	ntilation -	balanc	ed, extra	act or po	sitive in	out from	outside					119.54	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =		119.54	(331)
Energy for lighting (calculated in Appendix L)				334.24	(332)
Total delivered energy for all uses (307) + (309) + (310) + (312)	2) + (315) + (331) + (33	32)(237b) =		4117.92	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fac		missions g CO2/year	
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) If there is CHP us) ing two fuels repeat (363) to	(366) for the second	d fuel	95	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	833.11	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	852.13	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantant	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			852.13	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x	0.52	=	62.04	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	173.47	(379)
Total CO2, kg/year sum of (376)(382) =				1087.64	(383)
Dwelling CO2 Emission Rate (383) = (4) =				16.23	(384)
El rating (section 14)				86.99	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201			Stroma Softwa	are Vei	rsion:	om)	Versio	on: 1.0.5.51	
Address :		FI	operty <i>i</i>	Address:	Sample	3 (BOIII	OIII)			
1. Overall dwelling dimer	nsions:									
0 1"				a(m²)		Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor				67	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e))+(1n))	67	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										_
		econdary eating	1	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [0] = [0	X	40 =	0	(6a)
Number of open flues	0 +	0	+ -	0	Ī - [0	x	20 =	0	(6b)
Number of intermittent fan	is		·			2	x	10 =	20	(7a)
Number of passive vents					F	0	x	10 =	0	(7b)
Number of flueless gas fire	es				F	0	X ·	40 =	0	(7c)
		A. (0L) . (7-	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \						nanges per ho	our
Infiltration due to chimney If a pressurisation test has be					continue fr	20 om (9) to (\div (5) =	0.1	(8)
Number of storeys in the		a, proceda	10 (17), 0	ni ioi wido c	ortando in	0111 (0) 10 ((10)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening	•	oonding to	the great	er wall are	a (after					
If suspended wooden flo	• /- •	ed) or 0.1	l (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught sti	ripped							0	(14)
Window infiltration				0.25 - [0.2		-	(45)		0	(15)
Infiltration rate		:		(8) + (10)					0	(16)
Air permeability value, or If based on air permeabilit	•		•	•	•	etre of e	envelope	area	5	(17)
Air permeability value applies	•					is being u	sed		0.35	(18)
Number of sides sheltered				•	,	J			3	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.27	(21)
	r monthly wind speed							•	7	
Infiltration rate modified fo										
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan Feb I	Mar Apr May eed from Table 7				•	·	1]	
Jan Feb I	Mar Apr May	Jun	Jul 3.8	Aug	Sep 4	Oct 4.3	4.5	Dec 4.7]	
Jan Feb I	Mar Apr May eed from Table 7				•	·	1]	

0.35	0.34	0.33	0.3	0.29	d wind s	0.26	0.25	0.27	0.29	0.3	0.32		
alculate effe		l											
If mechanica	al ventila	ition:										0	(2
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)), othe	wise (23b) = (23a)			0	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(2
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
la)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	/IV) (24b)m = (22)	2b)m + (23b)		•	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•								
if (22b)n		(23b), t	· ` `	c) = (23b	ŕ	<u> </u>	c) = (22b		5 × (23b) -		i	
lc)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural									0.51				
if (22b)n ld)m= 0.56	0.56	en (24d) 0.56	m = (220)	0.54	0.53	0.53	0.5 + [(2	0.54	0.5]	0.55	0.55	Ī	(2
′ L						<u> </u>			0.54	0.55	0.55		(2
Effective air	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	(2
5)m= 0.56	0.56	0.56	0.54	0.34	0.55	0.55	0.55	0.54	0.34	0.55	0.55		(2
. Heat losse	s and he	eat loss	oaramete	er:									
LEMENT	Gros		Openin	-	Net Ar		U-valu		AXU		k-value		AXk
oors	area	(1112)	m	² 	A ,r	_	W/m2		(W/I	N)	kJ/m²-l	`	kJ/K
					2.4	X	1	= [2.4	H			(2
in <mark>dows</mark> Type					4.16		/[1/(1.4)+	, i	5.52	H			(2
indows Type	2				4.8	x1,	/[1/(1.4)+	0.04] =	6.36	빝.			(2
oor					67	X	0.13	= [8.71	<u></u>		<u> </u>	(2
alls Type1	29.4	4	8.96	<u> </u>	20.44	X X	0.18	=	3.68				(2
alls Type2	12		2.4		9.6	Х	0.18	=	1.73				(2
alls Type3	2.4	4	0		2.44	X	0.18	= [0.44				(2
tal area of e	lements	, m²			110.8	4							(3
or windows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
include the area				ls and par	titions		(0.0)	(20)					
bric heat los		•	U)				(26)(30)					28.84	
eat capacity		,	_						.(30) + (32	, , ,	(32e) =	5479.7	_
ermal mass	•	•		,					tive Value			250	(3
r design assess n be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
ermal bridge				usina Ar	pendix l	<						5.54	(3
letails of therma	•	,		• .	-	•						3.34	(
tal fabric he			()		•/			(33) +	(36) =			34.38	(3
entilation hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
37.12	36.97	36.82	36.11	35.98	35.36	35.36	35.25	35.6	35.98	36.24	36.52		(3
, ····=									·			ı	
	:oefficier	nt W/K						(39)m	$= (37) + \ell$	38)m			
eat transfer of	oefficier	nt, W/K 71.19	70.49	70.35	69.74	69.74	69.62	(39)m 69.98	70.35	38)m 70.62	70.9		

Heat loss para	at loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)												
(40)m= 1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.06		
Average = Sum(40) ₁₁₂ /12=											1.05	(40)	
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	4. Water heating energy requirement: kWh/year:												
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1													(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)													(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea			ctor from	Table 1c x			ļ.	!			
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
										m(44) ₁₁₂ =		1029.18	(44)
Energy content of	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= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous u	votor hooti	ng of noint	of use (no	hot water	r eterogol	ontor () in	haves (46		Total = Su	m(45) ₁₁₂ =	_ [1349.41	(45)
If inst <mark>antane</mark> ous v	_			-		_							(40)
(46)m= 20.99 Water storage	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel													(47)
If community heating and no tank in dwelling, enter 110 litres in (47)													()
Otherwise if no	-			-			, ,	ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufacturer's declared loss factor is known (kWh/day):										1.	39		(48)
Temperature factor from Table 2b										0.54			(49)
0,	Energy lost from water storage, kWh/year (48) x (49) = 0.75												(50)
b) If manufacturer's declared cylinder loss factor is not known:													(E1)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3													(51)
Volume factor from Table 2a 0													(52)
Temperature factor from Table 2b													(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$											0		(54)
5 (50) (54): (55)											75		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50) - (H11)] \div (50)$, else (57) m = (56) m where $(H11)$ is from Appendix H													
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit loss (annual) from Table 3													(58)
-	Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m												
•	(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)												
(59)m= 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	i loss ca	lculated	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 h	neat req	uired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		(62)
Solar DI	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	•	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
		-		-		-	-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	ude (57)	m in cald	culation o	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. In	ternal ga	ains (see	e Table 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=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	<mark>ig g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	18.37	16.32	13.27	10.05	7.51	6.34	6.85	8.91	11.95	15.18	17.72	18.89		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	s and fa	ns gains	(Table 5	 5a)		-	-	-		-	-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	/aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)				=	=		=	-			
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65		(72)
Total i	internal	gains =	:			(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	379.77	377.7	365.57	346.16	326.63	307.78	295.56	301.21	311.21	330.81	353.25	369.91		(73)
6. So	lar gains	S:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat		ion.		
Orient		Access F		Area		Flu		-	g_ 	_	FF		Gains	
	ļ	Table 6d		m²			ole 6a	, <u> </u>	able 6b		able 6c	<u></u>	(W)	_
East	0.9x	0.77	X	4.1	6	x 1	9.64	X	0.63	x	0.7	=	24.97	(76)
East	0.9x	0.77	х	4.8	3	x 1	9.64	х	0.63	x	0.7	=	28.81	(76)
East	0.9x	0.77	Х	4.1	6	x 3	88.42	X	0.63	x	0.7	=	48.85	(76)
East	0.9x	0.77	X	4.8	3	x 3	88.42	X	0.63	X	0.7	=	56.36	(76)

East	0.9x	0.77	X	4.16	X	63.2	27	x	0.63	x	0.7		=	80.44	(76)
East	0.9x	0.77	X	4.8	X	63.2	27	X	0.63	x	0.7		=	92.82	(76)
East	0.9x	0.77	X	4.16	X	92.2	28	x	0.63	X	0.7		=	117.32	(76)
East	0.9x	0.77	X	4.8	X	92.2	28	x	0.63	x	0.7		=	135.37	(76)
East	0.9x	0.77	X	4.16	X	113	.09	x	0.63	X	0.7		=	143.78	(76)
East	0.9x	0.77	X	4.8	X	113	.09	x	0.63	X	0.7		=	165.9	(76)
East	0.9x	0.77	X	4.16	X	115	.77	x	0.63	x	0.7		=	147.18	(76)
East	0.9x	0.77	X	4.8	X	115	.77	x	0.63	x	0.7		=	169.83	(76)
East	0.9x	0.77	X	4.16	X	110	.22	x	0.63	x	0.7		=	140.13	(76)
East	0.9x	0.77	X	4.8	X	110	.22	x	0.63	x	0.7		=	161.68	(76)
East	0.9x	0.77	X	4.16	X	94.0	68	x	0.63	X	0.7		=	120.37	(76)
East	0.9x	0.77	X	4.8	X	94.0	68	x	0.63	x	0.7		=	138.88	(76)
East	0.9x	0.77	X	4.16	X	73.	59	x	0.63	x	0.7		=	93.56	(76)
East	0.9x	0.77	X	4.8	X	73.	59	x	0.63	x	0.7		=	107.95	(76)
East	0.9x	0.77	X	4.16	X	45.	59	x	0.63	X	0.7		=	57.96	(76)
East	0.9x	0.77	X	4.8	X	45.	59	x	0.63	x	0.7		=	66.88	(76)
East	0.9x	0.77	X	4.16	X	24.4	49	x	0.63	x	0.7		=	31.13	(76)
East	0.9x	0.77	X	4.8	X	24.4	49	Х	0.63	X	0.7		=	35.92	(76)
East	0.9x	0.77	x	4.16	x	16.	15	x	0.63	х	0.7		=	20.53	(76)
East	0.9x	0.77	x	4.8	х	16.	15	×	0.63	Х	0.7		=	23.69	(76)
Solar g	ains in	watts, calcul	ated	for each m	nonth		(8	83)m	= Sum(74)m	. <mark>(8</mark> 2)m					
(83)m=	53.78	105.21 173	3.26	252.69 30	9.68			83)m 259.:		.(82)m 124.84	4 67.06	44.23	3		(83)
(83)m=	53.78		3.26	252.69 30	9.68						4 67.06	44.23	3		, ,
(83)m=	53.78	105.21 173	3.26 solar	252.69 30 (84)m = (7	9.68 3 (3)m + (83)m , v	301.81 watts		25 201.51			44.23			(83) (84)
(83)m= Total g (84)m=	53.78 ains — ii 433.55	105.21 173 nternal and s	3.26 solar 3.83	252.69 30 (84)m = (7 598.85 63	99.68 3 (3)m + (36.31	83)m , v	301.81 watts	259.	25 201.51	124.84					, ,
(83)m= Total g (84)m= 7. Me	53.78 ains — ii 433.55 an inter	105.21 173 nternal and s 482.91 538	3.26 solar 3.83 ure (252.69 30 (84)m = (7 598.85 63 heating se	9,68 3 (3)m + (36.31 (83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	, ,
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	(84)
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat during heati tor for gains	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se eriods in the ving area,	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71 Th1 (°C)	124.84	4 420.3		14	21	(84)
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(93)m= 19.13	19.3	19.6	19.99	20.28	20.41	20.44	20.43	20.36	19.98	19.49	19.1		(93)
8. Space hea	ting requ	uirement											
Set Ti to the					ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	ī									١		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	0.98	0.93	0.82	0.63	0.44	0.5	0.77	0.95	0.99	1	1	(94)
Useful gains,	!	ļ			0.03	0.44	0.5	0.77	0.93	0.99	'	İ	(01)
(95)m= 431.37	478.35	526.41	558.24	522.37	391.03	265.65	277.6	395.38	434.69	416.08	412.49		(95)
Monthly average								000.00		110.00	1.12.10	l	,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	an intern	al tempe	erature,	L Lm , W =	L =[(39)m :	x [(93)m	 – (96)m	1	ļ		l	
(97)m= 1060.36		932.66	781.63	603.7	405.41	267.51	280.88	437.95	660.12	875.06	1056.59		(97)
Space heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		l	
(98)m= 467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
							Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	2337.86	(98)
Space heatin	a require	ement in	kWh/m²	/vear								34.89	(99)
·	• .			•			:	NID)				04.00	
9a. Energy red	•	nts – Indi	viduai n	eating s	ystems i	nciuaing	micro-C	JHP)					
Space heating Fraction of sp		t from se	econdar	//supple	mentary	system						0	(201)
Fraction of sp					y		(202) = 1 -	(201) =				1	(202)
							(204) = (204)		(202)] _				╡` ′
Fraction of to							(204) = (2)	02) 🗓 [1 –	(203)] =			1	(204)
Efficiency of r												93.5	(206)
Efficiency of s	seconda	ry/supple	ementar	y heating	system	1, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin)							1	
467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
(211)m = {[(98)m x (20	4)] } x 1	00 ÷ (20	6)								-	(211)
500.5	394.55	323.26	172.02	64.72	0	0	0	0	179.37	353.44	512.52		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,101}	Ē	2500.39	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									
$= \{[(98)m \times (20)]\}$		00 ÷ (20	_			i						1	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating	-												
Output from w					400.04	404.00	442.50	440.47	400.0	400.00	400.00	1	
186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09	70.0	7(246)
Efficiency of w			24.04	00.50	70.0	70.0		T = 0	04.00	00.50	07.00	79.8	(216)
(217)m= 87.17	86.91	86.29	84.91	82.58	79.8	79.8	79.8	79.8	84.92	86.56	87.28	İ	(217)
Fuel for water $(219)m = (64)$	_												
(219)m = 213.95	189.22	200.33	182.75	184.34	170.73	164.23	179.84	179.41	189.46	196.24	208.63		
							Tota	I = Sum(2	19a) ₁₁₂ =	ı	ı	2259.13	(219)
Annual totals									k'	Wh/yeaı	•	kWh/year	
Space heating		ed, main	system	1						•		2500.39	
													_

Water heating fuel used				2259.13	1
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				324.5	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			5159.01	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa		Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	540.08	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	487.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1028.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	168.41	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		1235.39](272)](273)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 55.1 m²

Floor 0 3 m

26 m² (fraction 0.472) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nam	ne:	Source	:	Type:	Glazing:		Argon:	Frame:
DOOF	R	Manufac	urer	Solid				Wood
W		Manufac	urer	Windows	low-E, $En = 0$.05 <mark>, soft</mark> coat	No	
Balco	ny	Manufac	urer	Windows	low-E, $En = 0$.05, soft coat	No	

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
Balcony		W	West	0	0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>s</u>						
W	24	8.96	15.04	0.15	0	False	N/A
INT	24	2.4	21.6	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	55.1			0.11			N/A
Internal Elements	S						

Party Elements

Thermal bridges:

No information on thermal bridging (y=0.15) (y=0.15)

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system:

Water heating:

Water heating:

None

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 6 (Bott	om)			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (2\		Av. Ha	: a.b.4/\		Value a/m²	1
Ground floor					a(m²) 55.1	(1a) x		ight(m)	(2a) =	Volume(m ²	(3a)
Total floor area TFA = (1	a)+(1b)+(1c))+(1d)+(1e	e)+(1r	n) :	55.1	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdai neating 0	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ı r
Number of open flues	0	╡+ ፟	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa		L				J	0		10 =	0	(7a)
						Ļ			10 =		╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	rires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	eys, flues and	I fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has I			ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			<u>-</u>
Number of storeys in t Additional infiltration	he dw <mark>elling</mark> (ns)						1(0)	41.04	0	(9)
Structural infiltration: () 25 for steel	or timbor	frome or	. 0. 25 fo	r maaani	n, constr	ruotion	[(9)	-1]x0.1 =	0	= (10)
if both types of wall are p						•	uction			0	(11)
deducting areas of open	ings); if equal us	ser 0.35		-		·					
If suspended wooden		•	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window Window infiltration	s and doors	araugnt si	ırıppea		0.25 - [0.2	2 x (14) ÷ 1	001 -			0	(14)
Infiltration rate					•	+ (11) + (1	•	+ (15) =		0	(15)
Air permeability value,	a50 expres	sed in cub	oic metre	s per ho	. , , ,	. , ,	, , ,		area	3	(17)
If based on air permeabi				•	•	•			G	0.15	(18)
Air permeability value appli	-						is being us	sed			` ′
Number of sides sheltered	ed									3	(19)
Shelter factor					` ,	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorpora	_				(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified			1	1		-	-			1	
Jan Feb	Mar Apr		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1	l		T			T	T	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	

0.15	0.15	e (allowi	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe		_	rate for t	he appli	cable ca	se	<u> </u>				<u> </u>		
If mechanica												0.5	(2:
If exhaust air h		0		, ,	,	. ,	,, .	•) = (23a)		l	0.5	(2:
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2
a) If balance	ı —					- ` ` 	HR) (24a	``	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance	ı —						<u> </u>	<u> </u>	 				
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•					F (22h	.\			
$\frac{\text{if } (\angle \angle D) \text{fi}}{(\angle AC) \text{m} = 0}$	n < 0.5 ×	(23b), t	nen (240	(230) = (230)	o); otnerv	wise (24)	C) = (220)	0) M + 0.	5 × (230	0	0		(2
						<u> </u>			0	0			(2
d) If natural if (22b)n		on or wn en (24d)		•	•				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse					NI at A a				A >/ 1.1				V I
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valu W/m2		A X U (W/I	<)	k-value kJ/m²-k		X k J/K
oors					2.4	x	1.4	= [3.36				(2
/indows Type	1				4.16	x	1/[1/(1)+	0.04] =	4	Ħ			(2
Vindows Type					4.8		1/[1/(1)+	L L	4.62	Ħ			(2
loor					55.1	×	0.11] = [6.061	۲,		7	_ (2
/alls Type1	24		8.96		15.04	=	0.11		2.26	믁 ¦		┨ ├─	—\(^2
Valls Type2				_		=		=		믁 ¦		╣	—\(\frac{1}{2}
Valls Type3	24		2.4		21.6	×	0.15	=	3.23				=
• •	2.4	<u>i</u>	0		2.4	x	0.35	=	0.84				(2
otal area of e			.ffa ativa vui	ndow II ve	105.5		, formula 1	/F/1/II.vol	·a) · 0 041 a	a siran in	n	2.2	(3
for windows and include the area						ated using	i iorriiula 1	/[(e)+0.04j a	is giveri iri	paragrapri	3.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.37	(3
eat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	4679.06	<u> </u>
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	i	250	<u> </u>
or design assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste						_					ı		_
hermal bridge	•	,			•	<					l	15.83	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =		ı	40.19	(3
entilation hea		alculated	l monthly	,					$= 0.33 \times ($	25)m x (5)	l '	40.19	(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	13.64	13.48	12.69	12.53	11.74	11.74	11.58	12.06	12.53	12.85	13.17		(3
8)m= 13.8					I	I	ι	L	. 2.55	ı	l . Ŭ ,		,
· L		-+ \^\"						(0.0)	(07)	20) -			
88)m= 13.8 leat transfer of 53.99	coefficier 53.83	nt, W/K 53.67	52.88	52.72	51.93	51.93	51.77	(39)m 52.25	= (37) + (3 52.72	38)m 53.04	53.36		

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.98	0.97	0.96	0.96	0.94	0.94	0.94	0.95	0.96	0.96	0.97		
	!	!				!			Average =	Sum(40) ₁	12 /12=	0.96	(40)
Number of day		`							<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		84		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		7.91		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		
_						_				ım(44) ₁₁₂ =		934.88	(44)
Energy content of		used - cal					OTm / 3600						
(45)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		–
If inst <mark>antane</mark> ous w	vater heati	ng at point	of use (no	n hot water	storage).	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	_	1225.78	(45)
(46)m= 19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Water storage		17.2	10	14.55	12.72	11.01	10.21	13.30	10.07	17	10.40		(10)
Storage volum	ne (litres)	includir	ng any so	olar or <mark>W</mark>	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		oolorod l	ooo foot	or io kno		2/d0x/):							(40)
a) If manufact				oi is kiio	WII (KVVI	i/uay).					0		(48)
Temperature f							(40) (40)	\			0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage					Ι			(55) × (41)	ı				(=0)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	iv Ll	(56)
If cylinder contains										1		IA I I	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•		, ,		(1.	-1-1			
(modified by			ı —		ı —					- 	00.00		(EO)
(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)

Comb	i loss ca	lculated	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 I	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.36	161.08	169.97	153.49	151.23	136.29	132	143.32		159.11	166.83	178.35		(62)
Solar D	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	16.59	14.71	15.14	13.33	12.81	11.05	10.22	11.77	11.91	13.81	14.97	16.12	•	(63) (G2)
Outpu	t from w	ater hea	ter											
(64)m=	163.1	143.95	152.16	137.57	135.73	122.64	119.09	128.87	7 128.08	142.61	149.26	159.55		
		•				•		Ot	utput from wa	ater heate	r (annual)₁	12	1682.61	(64)
Heat o	gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	86.48	76.9	82.36	76.04	76.12	70.32	69.73	73.5	72.42	78.74	80.48	85.14		(65)
inclu	ude (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	ıs (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>tir</mark>	ng gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.29	13.58	11.05	8.36	6.25	5.28	5.7	7.41	9.95	12.63	14.74	15.72		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			•	
(68)m=	160.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooki	ng gains	(calcula	ted in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5			'	
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pump:	s and fa	ns gains	(Table 5	Ба)					•	!			ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (negat	ive valu	es) (Tab	le 5)			•	•	•		1	
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	[(71)
Water	heating	gains (T	able 5)						•				ı	
(72)m=	116.23	114.43	110.7	105.62	102.32	97.67	93.73	98.78	100.58	105.84	111.78	114.44		(72)
Total	internal	gains =				(66)	m + (67)m	+ (68)n	n + (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m=	342.57	340.73	330.26	313.56	296.88	280.66	270.06	275.17	7 283.69	300.57	319.89	334.13		(73)
6. So	lar gains	S:												
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu			_ g	_	FF		Gains	
		Table 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
West	0.9x	0.77	X	4.1	6	x 1	9.64	х	0.4	x	0.7	=	15.85	(80)
West	0.9x	0.77	X	4.8	8	x 1	9.64	х	0.4	x	0.7	=	18.29	(80)
West	0.9x	0.77	X	4.1	6	x 3	8.42	x	0.4	x	0.7	=	31.01	(80)
West	0.9x	0.77	X	4.8	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(80)

			_					_						
West	0.9x	0.77	X	4.16	x	6	3.27	X	0.4	x	0.7	=	51.07	(80)
West	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	x	0.7	=	58.93	(80)
West	0.9x	0.77	X	4.16	Х	g	92.28	X	0.4	X	0.7	=	74.49	(80)
West	0.9x	0.77	X	4.8	X	9	92.28	X	0.4	X	0.7	=	85.95	(80)
West	0.9x	0.77	x	4.16	х	1	13.09	X	0.4	x	0.7	=	91.29	(80)
West	0.9x	0.77	x	4.8	х	1	13.09	X	0.4	X	0.7	=	105.33	(80)
West	0.9x	0.77	x	4.16	x	1	15.77	x	0.4	X	0.7	=	93.45	(80)
West	0.9x	0.77	x	4.8	х	1	15.77	X	0.4	X	0.7	=	107.83	(80)
West	0.9x	0.77	x	4.16	х	1	10.22	X	0.4	X	0.7	=	88.97	(80)
West	0.9x	0.77	x	4.8	х	1	10.22	x	0.4	x	0.7	=	102.66	(80)
West	0.9x	0.77	X	4.16	х	9	94.68	x	0.4	X	0.7	=	76.42	(80)
West	0.9x	0.77	x	4.8	х	9	94.68	X	0.4	X	0.7	=	88.18	(80)
West	0.9x	0.77	x	4.16	x	7	73.59	x	0.4	x	0.7	=	59.4	(80)
West	0.9x	0.77	x	4.8	x	7	73.59	x	0.4	x	0.7		68.54	(80)
West	0.9x	0.77	x	4.16	x	4	15.59	x	0.4	X	0.7		36.8	(80)
West	0.9x	0.77	x	4.8	×	4	15.59	x	0.4	X	0.7		42.46	(80)
West	0.9x	0.77	x	4.16	x	2	24.49	x	0.4	x	0.7		19.77	(80)
West	0.9x	0.77	x	4.8	X	2	24.49	Х	0.4	X	0.7	=	22.81	(80)
West	0.9x	0.77	x	4.16	×	1	6.15	x	0.4	х	0.7	_	13.04	(80)
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	x	0.7	_ =	15.04	(80)
								7						
				Company of the	a makla			(00)	0 (74)	(00)				
Solar g	ains in	watts, calcul	ated	for each n	ionth			(83)m	$n = Sum(74)m \dots$.(8Z)m			_	
Solar g (83)m=	ains in 34.15		ated 0.01			201.28	191.63	(83)m 164		79.26		28.08		(83)
(83)m=	34.15		0.01	160.44	6.62		191.63	`			_	28.08		(83)
(83)m=	34.15	66.8 110 nternal and s	0.01	160.44 19 (84)m = (7	96.62 (3)m +		191.63	`	1.6 127.94		42.58	28.08 362.21		(83) (84)
(83)m= Total g	3 <mark>4.15</mark> ains — ii 376.72	66.8 110 nternal and s	0.01 solar 0.27	160.44 19 (84)m = (7 474 4	96.62 (3)m + 93.5	(83)m	191.63 , watts	164	1.6 127.94	79.26	42.58			, ,
(83)m= Total g (84)m= 7. Mea	3 <mark>4.15</mark> ains — ii 376.72 an inter	66.8 110 nternal and s 407.53 440	0.01 solar 0.27 ture (160.44 19 (84) m = $(7$ 474 49 (84) m seconds	96,62 (3)m + 93.5 (ason)	(83)m 481.94	191.63 , watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58		21	, ,
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter erature	66.8 110 nternal and s 407.53 440 nal tempera	o.01 solar o.27 ture (160.44 19 (84)m = (7 474 49 (heating seeriods in the	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94	191.63 , watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58			(84)
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter erature	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains	o.01 solar o.27 ture (160.44 19 (84)m = (7 474 49 heating seeriods in the ving area,	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94	191.63 , watts 461.69	439 ble 9	1.6 127.94 .77 411.64	79.26	3 362.47		21	(84)
Total g (84)m= 7. Mea	34.15 ains – in 376.72 an inter erature tion fac	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N	o.01 solar o.27 ture (ng po	160.44 19 (84)m = (7 474 4: (heating seeriods in the ving area, Apr	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94 g area t	191.63 , watts 461.69 from Tab	439 ble 9	.77 411.64 , Th1 (°C)	79.26	3 362.47 Nov	362.21	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – ii 376.72 an inter erature tion fac Jan 1	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (7 474 4: (heating seeriods in the ving area, Apr 0.95 0.95	96.62 93.5 93.5 e living h1,m (May 0.85	(83)m 481.94 g area t see Ta Jun 0.66	191.63 , watts 461.69 from Table 9a) Jul 0.49	164 439 ole 9 A	.77 411.64 , Th1 (°C) ug Sep	79.26 379.8	3 362.47 Nov	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – ii 376.72 an inter erature tion fac Jan 1	66.8 110 nternal and s 407.53 440 nal temperal during heati tor for gains Feb N 0.99 0. I temperatur	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (7 474 4: (heating seconds in the ving area, 195 0:00) (iving area - 196.44	96.62 93.5 93.5 e living h1,m (May 0.85	(83)m 481.94 g area t see Ta Jun 0.66	191.63 , watts 461.69 from Table 9a) Jul 0.49	164 439 ole 9 A	.77 411.64 , Th1 (°C) ug Sep 53 0.79	79.26 379.8	3 362.47 Nov 0.99	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 376.72 an interestature tion fact Jan 1 interna 20.07	66.8 110 nternal and s 407.53 440 nal temperator for gains Feb N 0.99 0.1 temperatur 20.19 20	o.01 solar o.27 ture (ong pofor life) 198 e in 1.39	160.44 19 (84)m = (7 474 4: (heating see eriods in the ving area,	e living h1,m (May 0.85 T1 (foll 0.88	(83)m 481.94 g area f see Ta Jun 0.66 ow ste 20.98	191.63 , watts 461.69 from Takable 9a) Jul 0.49 ps 3 to 7	439 ole 9 A 0.5 7 in T 20.	.77 411.64 , Th1 (°C) ug Sep 53 0.79 Table 9c) 99 20.94	79.26 379.8 Oct 0.96	3 362.47 Nov 0.99	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 376.72 an interestature tion fact Jan 1 interna 20.07	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N 0.99 0. I temperatur 20.19 20 during heati	o.01 solar o.27 ture (ong pofor life) 198 e in 1.39	160.44 19 (84)m = (7 474 4: (heating see eriods in the ving area, Apr 0.95 0 iving area 20.66 2: eriods in re	e living h1,m (May 0.85 T1 (foll 0.88	(83)m 481.94 g area f see Ta Jun 0.66 ow ste 20.98	191.63 , watts 461.69 from Takable 9a) Jul 0.49 ps 3 to 7	439 ole 9 A 0.5 7 in T 20.	.77 411.64 , Th1 (°C) ug Sep 53 0.79 Table 9c) 99 20.94 9, Th2 (°C)	79.26 379.8 Oct 0.96	3 362.47 Nov 0.99	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	34.15 ains – ii 376.72 an inter erature tion fac Jan 1 interna 20.07 erature 20.1	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N 0.99 0. I temperatur 20.19 20 during heati 20.1 20	o.01 o.01 o.01 o.01 o.01 o.01 o.01 o.01	160.44 19 (84)m = (7 474 4: (heating see eriods in the ving area, Apr 0.95 0 iving area 20.66 2: eriods in re 20.12 2:	96.62 93.5 e living h1,m (May 0.85 T1 (foll 0.88 est of d	(83)m 481.94 g area to see Ta Jun 0.66 ow ste 20.98 welling 20.13	191.63 , watts 461.69 from Table 9a) Jul 0.49 ps 3 to 7 21 from Table 20.13	164 439 Al 0.5 7 in T 20.	.77 411.64 , Th1 (°C) ug Sep 53 0.79 Table 9c) 99 20.94 9, Th2 (°C)	79.26 379.8 Oct 0.96	3 362.47 Nov 0.99	Dec 1 20.06	21	(84) (85) (86) (87)
(83)m= Total g (84)m= 7. Mea Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	34.15 ains – ii 376.72 an interestion factor Jan interna 20.07 erature 20.1 tion factor	66.8 110 Internal and statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the	o.01 o.01 o.01 o.01 o.01 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027 o.027	160.44 19 (84)m = (7 474 4 heating see eriods in the ving area, Apr 0.95 0 iving area 20.66 2 eriods in rea 20.12 2 est of dwel	e living h1,m (May 0.85) T1 (foll 0.88) est of d 0.12	(83)m 481.94 y area f see Ta Jun 0.66 ow ste 20.98 welling 20.13	191.63 , watts 461.69 from Table 9a) Jul 0.49 ps 3 to 7 21 from Table 20.13	439 ble 9 A 0.5 7 in T 20. 9a)	.77 411.64 .77 411.64 , Th1 (°C) ug Sep 53 0.79 Table 9c) 99 20.94 9, Th2 (°C) 13 20.13	79.26 379.8 Oct 0.96 20.68	3 362.47 Nov 0.99 2 20.11	Dec 1 20.06 20.11	21	(84) (85) (86) (87) (88)
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Mean (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	an interestion factors of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of 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379.8 Oct 0.96 20.68 20.12 0.94 9 9c) 19.75 A = Li	3 362.47 Nov 0.99 2 20.11 0.99 19.26 ving area ÷ (Dec 1 20.06 20.11 1	21	(84) (85) (86) (87) (88) (89)

(93)m= 19.44	19.58	19.83	20.17	20.41	20.52	20.54	20.54	20.49	20.19	19.76	19.42		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		l					5						
(94)m= 0.99	0.99	0.98	0.93	0.82	0.62	0.44	0.48	0.75	0.95	0.99	0.99		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m	•								
(95)m= 374.3	403.06	429.5	441.63	405.39	299.4	203.63	212.72	309.59	359.08	357.76	360.31		(95)
Monthly aver		r		from Ta	r e								
(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	1				i	- ,	· · ·	<u> </u>		074.70			(07)
(97)m= 817.25	790.13	715.57	595.82	459.34	307.59	204.56	214.28	333.61	505.4	671.72	812.02		(97)
Space heatin (98)m= 329.56	g require 260.12	212.84	111.02	40.14	/vn/mon	$\ln = 0.02$	24 X [(97))m – (95 0)m] X (4 108.86	226.05	336.07		
(90)111= 329.30	200.12	212.04	111.02	40.14		0		l per year		l .	Ь——	1624.65	(98)
0			1.10/1- / 0	1/			Tota	i per year	(KVVII/yeai) = Sum(9	O)15,912 —		= ' '
Space heatin	g require	ement in	KVVN/M²	/year							L	29.49	(99)
9b. Energy red				Ĭ									
This part is us Fraction of spa							.	•		unity sch	neme.	0	(301)
							(Table I	1) 0 11 11	OHE				=
Fraction of spa					•							1	(302)
The c <mark>ommu</mark> nity so includes boilers, h									up to four	other heat	sources; th	ne latter	
Fraction of hea					iom powor	Glations.	occ / ippoi	idix O.				1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) = [1	(304a)
Factor for con						r commu	unity hea	iting sys		_, (/ [1	(305)
Distribution los	ss factor	(Table 1	2c) for o	commun	itv heatii	na svste	m				[1.05	(306)
Space heating		()	,		,	3 - 7					L	kWh/yea	
Annual space	_	requiren	nent								[1624.65	<u>'</u>
Space heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	- [1705.88	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/suլ	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =	Ī	0	(309)
Water heating	3										_		_
Annual water I	neating r	equirem	ent									1682.61	
If DHW from c Water heat fro								(64) x (30	03a) x (30	5) x (306) :	= [1766.74	(310a)
Electricity use	d for hea	ıt distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	34.73	(313)
Cooling Syste	m Energ	y Efficie	ncy Ratio	0							ĺ	0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans v	within dv	velling (1	Γable 4f)	:					L		<u> </u>
mechanical ve							outside					98.31	(330a)
											_		=

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	(98.31	(331)
Energy for lighting (calculated in Appendix L)			2	70.05	(332)
Total delivered energy for all uses (307) + (309) + (310) + (31	2) + (315) + (331) + (33	32)(237b) =	3	840.99	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		sions 02/year	
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us) ing two fuels repeat (363) to	(366) for the second f	uel	95	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	789.57	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	18.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	-	807.59	(373)
CO2 associated with space heating (secondary)	(309) x	0	-	0	(374)
CO2 associated with water from immersion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			807.59	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x	0.52	=	51.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	140.16	(379)
Total CO2, kg/year sum of (376)(382) =				998.77	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				18.13	(384)
El rating (section 14)				86.63	(385)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	SAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
			Р	roperty.	Address	Sample	e 6 (Botte	om)			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (m- 2)		Av. Ha	: a.b.4/\		Value a/m²	21
Ground floor					a(m²) 55.1	(1a) x		ight(m)	(2a) =	Volume(m 3	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+(1r	n) (1	55.1	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	ry +	other 0	7 = [total	x	40 =	m³ per hou	ı r (6a)
Number of open flues	0	<u> </u>	0	- - - - - -	0]	0	x	20 =	0	(6b)
Number of intermittent fa			U		U	J L			10 =		(7a)
						Ļ	2		10 =	20	Ⅎ`ໍ
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas fi	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and f	ans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b	een ca <mark>rried o</mark> ut o	r is intende	ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			_
Number of storeys in the	he dw <mark>elling</mark> (n	s)								0	(9)
Additional infiltration	OF for steel o	u 4iaab a u 4		0.25 fo				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p.						•	uction			0	(11)
deducting areas of opening			portuning to	o uno groun	o. man aro	a (artor					
If suspended wooden to		•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en										0	(13)
Percentage of windows	s and doors d	raught st	ripped		0.25 - [0.2	v (1.4) · . 1	001			0	(14)
Window infiltration Infiltration rate					•	. ,	00] = 12) + (13) +	ı (15) –		0	(15)
Air permeability value,	a50 everess	ad in cub	ic metre	s nar ha	. , , ,	, , ,	, , ,		area	0	(16)
If based on air permeabil				•		•	elle oi e	ilvelope	aica	0.37	(17)
Air permeability value applie	•						is being us	sed		0.37	(10)
Number of sides sheltere	ed									3	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorporat	ting shelter fac	ctor			(21) = (18	x (20) =				0.29	(21)
Infiltration rate modified f	or monthly wir	nd speed	l							1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7	-							1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4										
	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.27	0.29	0.31	0.32	0.34		
alculate effe		•	rate for t	he appli	cable ca	se	<u>!</u>		<u>I</u>	!			
If mechanica							.=					0	(2:
If exhaust air he		0		, ,	,		,, .	,) = (23a)			0	(2:
If balanced with		•	•	•		,						0	(2
a) If balance	i				_	- ` ` 	- 	<u> </u>	 	` 	``	÷ 100] I	(0
4a)m= 0			0	0	0	0	0	0	0	0	0		(2
b) If balance	ı	1	ı		1		, ``	<u> </u>	 	- 		I	(2
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	ve input v o); otherv				5 v (23k	2)			
4c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0		(2
d) If natural		<u> </u>			<u> </u>	<u> </u>					, ,		
					erwise (2				0.5]				
4d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(2
Effective air	change	rate - er	nter (24a) or (24k	b) or (24	c) or (24	d) in box	(25)	<u>.</u>	!			
5)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0 <mark>.55</mark>	0.55	0.56		(2
B. Heat losse	s and ne				Net Ar	200	U-valı	10	AXU		k-value		ΑΧk
LEMENT	area		Openin m		A ,r		W/m2		A X U (W/	K)	kJ/m²-ł		A A K kJ/K
oo <mark>rs</mark>					2.4	x	1	= [2.4	À			(2
in <mark>dows</mark> Type	1				4.16	x1.	/[1/(1.4)+	0.04] =	5.52	Ħ			(2
indows Type	2				4.8	x1.	/[1/(1.4)+	0.04] =	6.36	Ħ			(2
oor					55.1	X	0.13	=	7.163	=			(2
alls Type1	24		8.96		15.04	x	0.18	=	2.71	_		╡┝	`(2
/alls Type2	24		2.4	=	21.6	_	0.18	-	3.89	=		╡	(2
alls Type3				_		=		=		<u> </u>		╡	===
• •	2.4		0		2.4	×	0.18	=	0.43				(2
otal area of e for windows and			offoctivo wi	ndow I I ve	105.5		r formula 1	/[/1/ L valu	(0) 1 () () (1)	as aivan in	naragranh	. 2 2	(3
include the area						ateu using	i ioiiiiuia i	/[(1/ U- vaic	(C)+ 0.04] (as giveii iii	i paragrapri	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				28.47	(3
eat capacity	Cm = S((Axk)						((28)	.(30) + (3	2) + (32a)	(32e) =	4679.06	(:
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(;
r design assess				construct	tion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
n be used inste				icina Ar	nondiy l	,					ı	5.00	
nermal bridge details of therma	•	,		•	•	`						5.28	(;
otal fabric he		are not kii	OWII (30) =	= 0.03 X (3) <i>(</i>)			(33) +	(36) =			33.74	(3
entilation hea		alculated	l monthly	y						(25)m x (5))	23.17	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	30.8	30.66	30	29.88	29.31	29.31	29.2	29.53	29.88	30.13	30.39		(3
30.94	30.0					i .	l		L	<u> </u>	1		•
, <u> </u>	<u> </u>	<u> </u>			•		-	(20)~	- (37) + (38)m	-		
30.94 eat transfer of 64.68	<u> </u>	<u> </u>	63.75	63.62	63.05	63.05	62.95	(39)m 63.27	= (37) + (38)m 63.87	64.13	· [

Heat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
40)m= 1.17	1.17	1.17	1.16	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16		
Number of day	e in moi	oth (Tah	le 1a)		•	•	•	,	Average =	Sum(40) ₁ .	12 /12=	1.16	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		84		(42)
Annual averag Reduce the annua not more that 125	e hot wa I average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.91		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	litres per	day for ea	ach month		ctor from T	Table 1c x	(43)						
44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		— (44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		934.88	(44)
45)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
									Total = Su	m(45) ₁₁₂ =		1225.78	(45)
f instantaneous w										<u>-</u>			(40)
46)m= 19.06 Water storage	16.67 loss:	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
f community h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)				'		
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Nater storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
, remperature fa					`	3,					54		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact			-										(- .)
Hot water stora f community h	•			e z (KVV	n/iitre/da	ıy)					0		(51)
/olume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,								0.	75		(55)
Nater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m 				
56)m= 23.33	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendi	ix H	(56
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
لـــــــا Primary circuit			m Table	<u> </u>			<u> </u>	<u> </u>	I	ļ	0		(58)
Primary circuit	loss cal	culated f	for each	month (•	. ,	, ,				~]		(55)
(modified by					ı —	ı —		-		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 I	loss cal	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)	ım						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		(62)
Solar DH	W 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 ad	ditional	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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		_
								Οι	utput from wa	ater heate	r (annual)₁	12	1774.4	(64)
Heat ga	ains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	79.53	70.63	75.41	69.32	69.18	63.6	62.79	66.55	65.7	71.8	73.76	78.2		(65)
includ	de (57)r	n in calc	culation o	of (65)m	only if o	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a):									
Metabo	lic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>ting</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	14.88	13.21	10.74	8.13	6.08	5.13	5.55	7.21	9.68	12.29	14.34	15.29		(67)
Applian	i <mark>ce</mark> s gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	16 0.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooking	g gains	(calcula	ited in A	pendix	L, equat	ion L15	or L15a)	, also	see Table	5				
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61		(71)
Water h	neating	gains (T	able 5)											
(72)m=	106.9	105.1	101.36	96.28	92.98	88.34	84.39	89.45	91.25	96.5	102.44	105.11		(72)
Total in	nternal	gains =	1			(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	'1)m + (72)	m		
(73)m=	335.82	334.02	323.62	307	290.37	274.19	263.57	268.63	3 277.09	293.89	313.16	327.36		(73)
6. Sola	ar gains	:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		ccess Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
West	_							-					` '	7,000
West	0.9x	0.77	X	4.1		-	9.64	X	0.63		0.7	=	24.97	(80)
West	0.9x	0.77	x	4.8			9.64	X	0.63		0.7	=	28.81	(80)
West	0.9x	0.77	X	4.1		-	88.42	X	0.63		0.7	=	48.85	(80)
44G91	0.9x	0.77	Х	4.8	В	x 3	88.42	X	0.63	x	0.7	=	56.36	(80)

			_		_		_						
West	0.9x	0.77	X	4.16	X	63.27	X	0.63	X	0.7	=	80.44	(80)
West	0.9x	0.77	X	4.8	X	63.27	X	0.63	X	0.7	=	92.82	(80)
West	0.9x	0.77	X	4.16	X	92.28	X	0.63	X	0.7	=	117.32	(80)
West	0.9x	0.77	X	4.8	X	92.28	X	0.63	X	0.7	=	135.37	(80)
West	0.9x	0.77	X	4.16	X	113.09	X	0.63	x	0.7	=	143.78	(80)
West	0.9x	0.77	X	4.8	X	113.09	X	0.63	x	0.7	=	165.9	(80)
West	0.9x	0.77	X	4.16	x	115.77	X	0.63	x	0.7	=	147.18	(80)
West	0.9x	0.77	X	4.8	x	115.77	X	0.63	x	0.7	=	169.83	(80)
West	0.9x	0.77	X	4.16	x	110.22	X	0.63	x	0.7	=	140.13	(80)
West	0.9x	0.77	X	4.8	x	110.22	X	0.63	x	0.7	=	161.68	(80)
West	0.9x	0.77	X	4.16	x	94.68	X	0.63	X	0.7	=	120.37	(80)
West	0.9x	0.77	X	4.8	x	94.68	X	0.63	x	0.7	=	138.88	(80)
West	0.9x	0.77	X	4.16	x	73.59	X	0.63	x	0.7	=	93.56	(80)
West	0.9x	0.77	X	4.8	x	73.59	X	0.63	X	0.7	=	107.95	(80)
West	0.9x	0.77	X	4.16	X	45.59	X	0.63	x	0.7	=	57.96	(80)
West	0.9x	0.77	x	4.8	x	45.59	X	0.63	X	0.7	=	66.88	(80)
West	0.9x	0.77	x	4.16	x	24.49	X	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	X	4.8	X	24.49	X	0.63	X	0.7		35.92	(80)
West	0.9x	0.77	x	4.16	x	16.15	x	0.63	X	0.7		20.53	(80)
West	0.9x	0.77	x	4.8	х	16.15] x	0.63	x	0.7		23.69	(80)
							7						
			-4	for sook wood	th		(92\m	n = Sum(74)m	(92)m				
Solar g	ains in	watts, calcu	ated	for each thor	ILIN		(03)11	I = Sum(T+)m	.(02)111			_	
Solar g (83)m=	53.78		3.26	252.69 309.6		17.01 301.81	259		124.8	_	44.23		(83)
(83)m=	53.78	105.21 173	3.26		8 3		Ť			_	44.23		(83)
(83)m=	53.78	105.21 173 nternal and s	3.26	252.69 309.6	n + (Ť	.25 201.51		4 67.06	44.23 371.59]	(83) (84)
(83)m= Total g	5 <mark>3.78</mark> ains — ii 389.6	105.21 173 nternal and s 439.23 496	3.26 solar 5.88	$\begin{array}{c c} 252.69 & 309.6 \\ \hline (84)m = (73)i \end{array}$	n + (83)m , watts	259	.25 201.51	124.8	4 67.06]	, ,
(83)m= Total g (84)m= 7. Mea	53.78 ains — ii 389.6 an inter	105.21 173 nternal and s 439.23 496 nal tempera	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seas	n + (on)	83)m , watts	259 527	.88 478.6	124.8	4 67.06		21	, ,
Total g (84)m= 7. Mea	53.78 ains — ir 389.6 an inter erature	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seas	08 3 m + (05 8 on)	83)m , watts 91.2 565.38 area from Ta	259 527	.88 478.6	124.8	4 67.06		21	(84)
Total g (84)m= 7. Mea	53.78 ains — ir 389.6 an inter erature	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seaseriods in the I	00 (some state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of	83)m , watts 91.2 565.38 area from Ta	527 ble 9	.88 478.6	124.8	4 67.06 3 380.21		21	(84)
Total g (84)m= 7. Mea	53.78 ains – ir 389.6 an inter erature tion fac	105.21 173 nternal and s 439.23 496 nal tempera during heati tor for gains Feb A	3.26 solar 3.88 ture (ng pe	252.69 309.6 (84)m = (73)n 559.69 600.0 heating seas eriods in the I ving area, h1	m + (05	watts 91.2 565.38 area from Ta ee Table 9a)	527 ble 9	.88 478.6 , Th1 (°C)	124.8	3 380.21 Nov	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1	105.21 173 nternal and s 439.23 496 nal tempera during heatistor for gains Feb N 0.99 0.	solar solar s.88 ture (ng pe for li	252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seaseriods in the I ving area, h1 Apr Ma 0.94 0.83	on) iving ,,m (s	83)m , watts 91.2 565.38 area from Ta ee Table 9a) Jun Jul	259 527 ble 9 0.5	.88 478.6 , Th1 (°C) ug Sep	124.8 418.7	3 380.21 Nov	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1	105.21 173 nternal and s 439.23 496 nal tempera during heati tor for gains Feb N 0.99 0. I temperatur	solar solar s.88 ture (ng pe for li	252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seaseriods in the I ving area, h1 Apr Ma 0.94 0.83	on) iving ,,m (s	83)m , watts 991.2 565.38 area from Ta ee Table 9a) Jun Jul 0.65 0.48	259 527 ble 9 0.5	.25 201.51 .88 478.6 .7 .7 .7 .7 .7 .7 .7	124.8 418.7	4 67.06 3 380.21 . Nov 0.99	371.59	21	(84)
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	9.04 (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 the utilisation factor for gains using Table 9a	e-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains, hm:	500
(94)m= 0.99 0.99 0.97 0.91 0.79 0.6 0.43 0.48 0.75 0.94 0.99	.99 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	9.48 (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	1.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 955.18 926.41 842.45 707.2 546.66 367.27 242.68 254.72 396.54 596.52 788.88 9	1.45 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
Total per year (kWh/year) = Sum(98)-	912 = 2097.63 (98)
Space heating requirement in kWh/m²/year	38.07 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1 (204)
Efficiency of main space heating system 1	93.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec kWh/year
Space heating requirement (calculated above)	
422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
	3.09
Total (kWh/year) =Sum(211) _{15,1012} =	2243.46 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)]} x 100 ÷ (208)	
(215)m= 0 0 0 0 0 0 0 0 0 0 0	0
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)
Water heating	
Output from water heater (calculated above)	
	9.67
Efficiency of water heater	79.8 (216)
	7.21 (217)
Fuel for water heating, kWh/month	
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 199.41 176.5 187.19 171.23 172.91 160.26 154.53 168.72 168.15 177.37 183.21 172.91 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183$	4.56
Total = Sum(219a) ₁₁₂ =	2114.03 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	- NVVII/y Cai
opace ricating faci asea, main system i	2243.46

					_
Water heating fuel used				2114.03	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				262.71	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4695.2	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	484.59	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	456.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			941.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	136.34	(268)
Total CO2, kg/year TER =	sum	n of (265)(271) =		20.26	(272)

SAP Input

Property Details: Sample 4 (Top)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height:

Floor 0 67 m^2 3 m

Living area: 27.3 m² (fraction 0.407)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
DOO	R	<u>Manufacturer</u>	Solid			W <mark>ood</mark>
W		<u>Manufacturer</u>	Windows	low-E, $En = 0.05$, s	<mark>soft</mark> coat No	
S		Manufacturer	Windows	low-E, En = 0.05 , s	soft coat No	
Balco	ony	Manufactur <mark>e</mark> r	Windows	low-E, $En = 0.05$, s	<mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Opaque Elements:

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elem	<u>ients</u>						
S	31.7	10.24	21.46	0.15	0	False	N/A
W	19	1.44	17.56	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Roof	67	0	67	0.11	0		N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 4 (Top))			
Address :											
1. Overall dwelling dime	ensions:			Aro	a(m²)		Av. Ho	ight(m)		Volume(m	3)
Ground floor				Ale	• ,	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)-	+(1d)+(1e	e)+(1r	٦)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ır — _(6a)
Number of open flues	0	╡ + ト	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa						J		x	10 =		(7a)
						Ļ	0		10 =	0	╡`´
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimne	eys, flues and	fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l			ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	he dw <mark>elling</mark> (r	ns)						1(0)	41.04	0	(9)
Structural infiltration: 0) 25 for stool (ar timbar	frome or	. 0. 25 fo	r maaani	n, constr	ruotion	[(9)	-1]x0.1 =	0	= (10)
if both types of wall are p						•	uction			0	(11)
deducting areas of openi	ings); if equal use	er 0.35		-		·					_
If suspended wooden		•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window Window infiltration	s and doors o	iraugnt st	rippea		0.25 - [0.2	2 x (14) ÷ 1	001 -			0	(14)
Infiltration rate					•	+ (11) + (1	-	+ (15) =		0	(15)
Air permeability value,	a50 express	ed in cub	ic metre	s per ho					area	3	(10)
If based on air permeabi				•	•	•			G	0.15	(18)
Air permeability value applie	•						is being us	sed			` ′
Number of sides sheltered	ed									2	(19)
Shelter factor					` ,	[0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified		'		Ι.	Ι.	T _	T -	Ι.	T _	1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp	-			1	1	1	1	1	1	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (2	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]	

djusted infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				•	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
<i>Calculate effec</i> If mechanica		•	rate for t	пе аррп	саріе са	se						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)		`
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (23b)	•		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho				•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v					•				0.5]			-	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss	paramete	er:							_	_	
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
)oors					2.4	х	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				1.44	x	1/[1/(1)+	0.04] =	1.38				(27
Vindows Type	2				5.44	X	1/[1/(1)+	0.04] =	5.23				(27
Vindows Type	3				4.8	Х	1/[1/(1)+	0.04] =	4.62				(27
Valls Type1	31.	7	10.24	4	21.46	S X	0.15	= [3.22				(29
Valls Type2	19		1.44		17.56	X	0.15	= [2.63				(29
Valls Type3	11.	1	2.4		8.7	X	0.15	= [1.3				(29
Valls Type4	2.4	,	0		2.4	X	0.35	= [0.84				(29
Roof	67	,	0		67	X	0.11	= [7.37				(30
otal area of el	ements	, m²			131.2	2							(3
for windows and i * include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
abric heat los				o ana par	1110110		(26)(30)) + (32) =				29.96	(33
leat capacity (•	- /					((28)	(30) + (32	2) + (32a).	(32e) =	1304.6	
hermal mass			P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assessi an be used instea				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						19.68	(30
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			49.64	(3
entilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		

								1			I	(2.2)
` '	52 17.31		16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer coeff			1	T	T	T	- ` 	= (37) + (T	I	
(39)m= 67.37 67	16 66.94	65.89	65.68	64.62	64.62	64.41	65.04	65.68	66.1	66.52	65.02	(39)
Heat loss paramet	er (HLP), \	N/m²K						= (39)m ÷	Sum(39) ₁ - (4)	12 / 1 Z=	65.83	(39)
(40)m= 1.01	1	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.99	0.99		_
Number of days in	month (Ta	able 1a)					,	Average =	Sum(40)₁	12 /12=	0.98	(40)
	eb Mai		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	8 31	30	31	30	31	31	30	31	30	31		(41)
L .	!		•				l				J	
4. Water heating	energy rec	uirement:								kWh/ye	ear:	
Assumed secures	ov. N										ı	(40)
Assumed occupar if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76	x [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.17		(42)
Annual average h		age in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		85	5.76	1	(43)
Reduce the annual ave	rage hot wat	er usage by	5% if the c	lwelling is	designed			se target o			1	, ,
not more that 125 litres		7 1			<u>, </u>			0 1				
Jan F Hot water usage in litre	eb Mai		May	Jun	Jul Table 1c x	(43)	Sep	Oct	Nov	Dec		
(44)m= 94.34 90			80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
(44)111= 34.34 30	51 07.40	04.00	00.02	77.15	17.15	00.02			m(44) ₁₁₂ :		1029.18	(44)
Energy content of hot w	vater used - d	ca <mark>lculate</mark> d m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			` '			` ′
(45)m= 139.91 122	.36 126.2	7 110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If instantaneous water	hooting of no	int of upo (n	o hot wata	r otorogo)	ontor O in	hoves (46		Total = Su	m(45) ₁₁₂ :	=	1349.41	(45)
			1		1	· ·	. , ,	47.45	10.70	00.00	1	(46)
(46)m= 20.99 18 Water storage loss	35 18.94 :	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volume (li	res) includ	ding any s	olar or V	WHRS	storage	within sa	ame ves	sel		0		(47)
If community heati	ng and no	tank in dv	velling, e	enter 110) litres in	(47)					1	
Otherwise if no sto		ater (this i	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water storage loss a) If manufacturer		d loss fact	or is kno	wn (kWł	n/day).					0		(48)
Temperature factor			000	(.,, , .					0		(49)
Energy lost from w			ear			(48) x (49)) =			10		(50)
b) If manufacturer	's declared	d cylinder	loss fact									, ,
Hot water storage			le 2 (kW	h/litre/da	ay)				0	.02		(51)
If community heati Volume factor fron	•	JUON 4.3							1	.03		(52)
Temperature factor		le 2b							-).6		(53)
Energy lost from w	ater storaç	ge, kWh/y	ear			(47) x (51)) x (52) x (53) =	1	.03		(54)
Enter (50) or (54)	in (55)								1	.03		(55)
Water storage loss	calculated	d for each	month			((56)m = (55) × (41)	m				
` '	92 32.01		32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dec	icated solar s	storage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	60), else (5	7)m = (56)	m where (H11) is fro	om Append	ix H	
(57)m= 32.01 28	92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated f	for each month (59)m = (58)	÷ 365 × (41)	m				•	
(modified by factor from Tab	le H5 if there is	solar water h	neating and a	cylinder	thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23	3.26 23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365 ×	د (41)m						
(61)m= 0 0 0	0 0	0	0 0	0	0	0	0		(61)
Total heat required for water he	eating calculated	for each m	onth (62)m =	: 0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.18 172.29 181.54	163.58 160.9	144.64 13	9.74 152.2	151.57	169.58	178.26	190.77		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative qu	uantity) (enter '0	if no solar	contribut	ion to wate	r heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, se	e Appendix (3)					
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 18.03 16.04 16.49	14.58 14.03	12.18 11	1.28 12.94	13.08	15.09	16.32	17.54		(63) (G2
Output from water heater									
(64)m= 174.47 153.83 162.37	146.4 144.19	129.86 12	5.78 136.58	135.89	151.81	159.35	170.55		_
			Out	out from wa	ater heate	r (annual) ₁	12	1791.08	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (4	45)m + (61)n	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.74 80.63 86.21	79.4 79.34	73.1 72	2.31 76.45	75.41	82.23	84.28	89.27		(65)
include (57)m in calculation	of (65)m only if c	ylinder is in	the dwelling	or hot wa	ate <mark>r is</mark> fr	om com	munity h	eating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	ts								
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56 10	8.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	opendix L, equat	ion L9 or L9	a), also see	Table 5					
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6	.66 8.66	11.62	14.75	17.22	18.36		(67)
Appliances gains (calculated in	n Appendix L, eq	uation L13 o	or L13a), also	see Tal	ole 5	-			
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 14	2.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	ppendix L, equa	tion L15 or L	_15a), also s	ee Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 33	33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	5a)		=	-		-			
(70)m= 0 0 0	0 0	0	0 0	0	0	0	0		(70)
Losses e.g. evaporation (negative	tive values) (Tab	ole 5)	•	•				•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -8	6.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)		-						•	
(72)m= 121.96 119.98 115.87	110.27 106.64	101.53 97	7.18 102.75	104.73	110.52	117.06	119.99		(72)
Total internal gains =		(66)m +	(67)m + (68)m	+ (69)m + (70)m + (7	1)m + (72)	m	•	
(73)m= 385.59 383.58 371.53	352.22 332.75	313.94 30	01.7 307.29	317.21	336.72	359.09	375.72		(73)
6. Solar gains:			·						
Solar gains are calculated using solar	r flux from Table 6a	and associated	l equations to co	onvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table (6a T	g_ able 6b	Т	FF able 6c		Gains (W)	
O a vith					T x Г			, ,	(78)
South 0.9x 0.77 x	5.44	X 46.75	<u> </u>	0.4	」 ^ L	0.7	=	49.35	J(10)

	-					_				_ ,				_
South	0.9x	0.77	X	4.8		x	46.75	X	0.4	X	0.7	=	43.54	(78)
South	0.9x	0.77	X	5.44		×	76.57	X	0.4	X	0.7	=	80.82	(78)
South	0.9x	0.77	X	4.8		x	76.57	X	0.4	x	0.7	=	71.31	(78)
South	0.9x	0.77	X	5.44		X	97.53	X	0.4	X	0.7	=	102.95	(78)
South	0.9x	0.77	X	4.8		x	97.53	X	0.4	X	0.7	=	90.84	(78)
South	0.9x	0.77	X	5.44		x	110.23	X	0.4	X	0.7	=	116.36	(78)
South	0.9x	0.77	X	4.8		x	110.23	X	0.4	x	0.7	=	102.67	(78)
South	0.9x	0.77	X	5.44		x	114.87	X	0.4	X	0.7	=	121.26	(78)
South	0.9x	0.77	X	4.8		x	114.87	X	0.4	X	0.7	=	106.99	(78)
South	0.9x	0.77	X	5.44		x	110.55	X	0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77	X	4.8		x	110.55	x	0.4	x	0.7	=	102.96	(78)
South	0.9x	0.77	X	5.44		x	108.01	x	0.4	x	0.7	=	114.01	(78)
South	0.9x	0.77	X	4.8		x	108.01	X	0.4	x	0.7	=	100.6	(78)
South	0.9x	0.77	X	5.44		x	104.89	x	0.4	x	0.7	=	110.72	(78)
South	0.9x	0.77	x	4.8		x	104.89	x	0.4	x	0.7	=	97.7	(78)
South	0.9x	0.77	x	5.44		x	101.89	x	0.4	x	0.7	=	107.55	(78)
South	0.9x	0.77	x	4.8		x [101.89	x	0.4	x	0.7	=	94.9	(78)
South	0.9x	0.77	x	5.44		x [82.59	Х	0.4	Х	0.7	=	87.18	(78)
South	0.9x	0.77	×	4.8	=	x	82.59	х	0.4	х	0.7	=	76.92	(78)
South	0.9x	0.77	×	5.44		х	55.42	×	0.4	х	0.7	=	58.5	(78)
South	0.9x	0.77	x	4.8		x	55.42	x	0.4	х	0.7	=	51.62	(78)
South	0.9x	0.77	×	5.44		x [40.4	х	0.4	x	0.7	-	42.64	(78)
South	0.9x	0.77	X	4.8	7	x	40.4	X	0.4	х	0.7	=	37.63	(78)
West	0.9x	0.77	x	1.44		х	19.64	x	0.4	х	0.7	=	5.49	(80)
West	0.9x	0.77	×	1.44		х	38.42	x	0.4	x	0.7	=	10.74	(80)
West	0.9x	0.77	x	1.44		x	63.27	x	0.4	x	0.7		17.68	(80)
West	0.9x	0.77	X	1.44		x	92.28	x	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	x	1.44		x	113.09	x	0.4	×	0.7		31.6	(80)
West	0.9x	0.77	x	1.44		x	115.77	x	0.4	x	0.7		32.35	(80)
West	0.9x	0.77	x	1.44		x	110.22	x	0.4	x	0.7		30.8	(80)
West	0.9x	0.77	x	1.44		x [94.68	x	0.4	x	0.7	=	26.45	(80)
West	0.9x	0.77	x	1.44		х	73.59	x	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	x	1.44		x [45.59	x	0.4	x	0.7	=	12.74	(80)
West	0.9x	0.77	×	1.44		x [24.49	x	0.4	×	0.7	_ =	6.84	(80)
West	0.9x	0.77	×	1.44		х	16.15	x	0.4	×	0.7		4.51	(80)
						_		•						
Solar g	ains in	watts, cal	culated	for each	month			(83)m	ı = Sum(74)m	(82)m				
(83)m=	98.38	162.87	211.48	244.82	259.85	2	245.41	234	.88 223.01	176.83	116.95	84.78		(83)
Total ga	ains – i	nternal an	d solar	(84)m =	(73)m ·	+ (8	3)m , watts							
(84)m=	483.97	546.46	583.01	597.03	592.6	56	5.95 547.11	542	.17 540.21	513.55	476.04	460.5		(84)
7. Mea	an inter	nal tempe	erature	(heating s	season)								
							area from Tab	ole 9	Th1 (°C)				21	(85)
•		•	٠.			-	e Table 9a)							
ſ	Jan	Feb	Mar	Apr	May	È	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
01	OAD 004	12 Varaian: 1	0.5.54 /	-	In 11 11	•		•		•		•		5 of 7

(86)m=	0.99	0.99	0.98	0.94	0.86	0.69	0.51	0.54	0.76	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	20.07	20.22	20.42	20.66	20.86	20.97	21	20.99	20.95	20.71	20.35	20.05		(87)
Tempe	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.08	20.08	20.08	20.1	20.1	20.11	20.11	20.12	20.11	20.1	20.09	20.09		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)					'	
(89)m=	0.99	0.99	0.97	0.92	0.82	0.61	0.41	0.44	0.69	0.92	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to 1	7 in Tabl	le 9c)			l	
(90)m=	18.85	19.07	19.36	19.7	19.96	20.09	20.11	20.11	20.07	19.78	19.27	18.82		(90)
				Į.		Į.	Į.	Į.	1	fLA = Livin	g area ÷ (4) =	0.41	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fl	A) x T2					
(92)m=	19.35	19.54	19.79	20.09	20.33	20.45	20.47	20.47	20.43	20.16	19.71	19.32		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	ļ			
(93)m=	19.35	19.54	19.79	20.09	20.33	20.45	20.47	20.47	20.43	20.16	19.71	19.32		(93)
8. Spa	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	ıt Ti,m=(76)m an	d re-calc	ulate	
the uti			or gains			live	11	A	Can	Oct	Nav	Dee		
L Litilisa	Jan tion fac	Feb	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.98	0.97	0.92	0.83	0.65	0.45	0.48	0.72	0.92	0.98	0.99		(94)
L	l gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	479.93	537.31	563.24	552.12	492.69	365.13	248.72	260.28	387.24	473.6	467.42	457.5		(95)
Month	ly aver	age exte	rnal tem	perature	from T	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Г		r —	1	T	ı —	ı	=[(39)m :			r –			<u> </u>	(07)
` ' L	1013.82		889.74	737.57	566.46	378.05	250.18	262.28	411.46	627.84	833.51	1006		(97)
Space (98)m=	397.22	g require 299.49	242.92	133.53	54.89	/vn/mon	th = 0.02	24 X [(97])m – (95 0	114.75	263.58	408.09		
(00)111=	001.22	200.40	242.02	100.00	04.00					(kWh/year	l		1914.46	(98)
Space	hootin	a roquir	omant in	I/\/\/b/m2	2/voor			7010	ii poi youi	(ittini) you) = Ca m(c	0)15,912		_
•		•	ement in										28.57	(99)
						scheme		lina nua.	يرجا لمحامات					
							ater heat heating (unity Scr	ieme.	0	(301)
	•			•		1 – (30	_	`	,				1	(302)
	•			•	•	,	,	allows for	CUD and	un to four	other heat	oouroos: f		(002)
	-						r stations.			up to rour (otner neat	sources; ti	ie ialler	
Fraction	n of hea	at from C	Commun	ity boiler	'S								1	(303a)
Fraction	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor f	for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
					,	` ''	ng syste	•	0 ,				1.05	(306)
			, , abio	0, 101 (, 1100111	5,510							
Space Annual		_	requiren	nent								ļ	kWh/ye 1914.46	аг
,aai	Space	oamig	. 54411011										1314.40	

Space heat from Community boilers	(98) x (304a)	x (305) x (306) =	2010.19	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Appe	endix E)	0	(308)
Space heating requirement from secondary/supplement	tary system (98) x (301) x	x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1791.08]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a)	x (305) x (306) =	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(3	.07e) + (310a)(310e)] =	38.91	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	enter 0) = (107) ÷ (31	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in			119.54	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	119.54	(331)
Energy for lighting (calculated in Appendix L)			315.44	(332)
Total delivered energy for all uses (307) + (309) + (310)	+ (312) + (315) + (331) + (332) (237h) =	4325.81	(338)
	(0.2) (0.0) (001) (002)(2015) =		
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (no lifthere is	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (no	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	Energy kWh/year ot CHP) CHP using two fuels repeat (363)	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 =	Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 =	Emissions kg CO2/year 95 884.65 20.19 904.84	(367a) (367) (372)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 372) = 0 =	Emissions kg CO2/year 95 884.65 20.19 904.84	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52	Emissions kg CO2/year 95 884.65 20.19 904.84	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or incommunity.	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.52	Emissions kg CO2/year 95 884.65 20.19 904.84 0 904.84	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or intotal CO2 associated with space and water heating	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22	Emissions kg CO2/year 95 884.65 20.19 904.84 0 904.84 62.04	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) = in dwelling (331)) x (332))) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	Emissions kg CO2/year 95 884.65 20.19 904.84 0 904.84 62.04	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with CO2 associated with electricity for lighting	Energy kWh/year of CHP) CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x stantaneous heater (312) x (373) + (374) + (375) = in dwelling (331)) x (332))) x	Emission factor kg CO2/kWh to (366) for the second fue 0.22 = 0.52 = 0.52 = 0.22 = 0.52 = 0.22 = 0.22 = 0.22 = 0.22 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	## Page 16	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

					User D	etails:						
Assessor Name: Software Name:	Stron	na FS <i>F</i>	AP 201	2		Strom Softwa				Versio	n: 1.0.5.51	
				Р	roperty .	Address	Sample	e 4 (Top))			
Address :												
1. Overall dwelling dime	ensions:											
Ground floor					Area	a(m²)	(4-)		ight(m)	1(0-)	Volume(m	<u> </u>
							(1a) x		3	(2a) =	201	(3a
Total floor area TFA = (1	a)+(1b)+	+(1c)+(1	1d)+(1e)+(1r	ו) [67	(4)					
Dwelling volume							(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:												
		ain ating		econdar eating	у	other		total			m³ per hou	ır
Number of chimneys		0	+	0] + [0	=	0	X 4	40 =	0	(6a
Number of open flues		0	Ī + Ē	0	Ī + Ē	0	Ī = Ē	0	x2	20 =	0	(6b
Number of intermittent fa	ans						'	2	x ²	10 =	20	(7a
Number of passive vents	3						F	0	x [,]	10 =	0	(7b
Number of flueless gas f							L			10 =		=
Nulliber of flueless gas f	1163						L	0			0	(70
										Air ch	anges <mark>per</mark> he	our
Infiltration due to chimne	ys, flues	and fa	ns = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has l							continue fr					` ′
Number of storeys in t	he dw <mark>elli</mark>	ing (ns))								0	(9)
Additional infiltration					2.25 ([(9)-	-1]x0.1 =	0	(10
Structural infiltration: 0 if both types of wall are p							•	ruction			0	(11
deducting areas of openi				oonaing to	rino groat	or wan are	a (anoi					
If suspended wooden			•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, er	,	•									0	(13
Percentage of window	s and do	ors dra	aught st	ripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14
Window infiltration Infiltration rate						•	, ,	100] <i>-</i> 12) + (13) -	+ (15) =		0	(15
Air permeability value,	. a50. ext	pressed	d in cub	ic metre						area	5	(17
If based on air permeabi		•				•	•		0.0 p 0	u. • u	0.35	(18
Air permeability value applie	-							is being u	sed			
Number of sides shelter	∍d					(00)		10)1			2	(19
Shelter factor						(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorpora	•					(21) = (18) X (20) =				0.3	(21
Infiltration rate modified	i				1, .1	۸	Con	Oct	NIc.:	Des		
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	i			2.0	20	27		4.2	15	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 Factor (22a)m = (2	:2)m ÷ 4											
(22a)m= 1.27 1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

		<u> </u>				i ´	(21a) x	` ´	0.00	0.00		1	
0.38 alculate effec	0.37 ctive air	0.36 change	0.33 rate for t	0.32 he appli	0.28	0.28 ISE	0.27	0.3	0.32	0.33	0.35		
If mechanica		•										0	
If exhaust air he	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	
If balanced with	heat reco	overy: effic	ciency in %	allowing	for in-use f	actor (fron	n Table 4h) =				0	
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
la)m= 0	0	0	0	0	0	0	0	0	0	0	0		
b) If balance	d mech	anical ve	entilation	without	heat red	covery (l	MV) (24b)m = (22	2b)m + (2	23b)		_	
1b)m= 0	0	0	0	0	0	0	0	0	0	0	0		
c) If whole h if (22b)m				•	-				.5 × (23b	o)			
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0		
d) If natural if (22b)m									0.5]			_	
ld)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]	
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)				_	
5)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		
. Heat losses	s and he	eat loss	paramete	er:							_	_	
LEMENT	Gros		Openin		Net Ar	rea	U-val	ue	AXU		k-value	Э	ΑXk
	area	(m ²)	· m	2	A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-	K	kJ/K
oors					2.4	X	1	=	2.4				
indows Type					1.44	x1	/[1/(1.4)+	0.04] =	1.91	Ц			
indows Type	2				5.44	x1	/[1/(1.4)+	0.04] =	7.21	Ц			
indows Type	3				4.8	x1	/[1/(1.4)+	0.04] =	6.36				
alls Type1	31.	7	10.2	4	21.46	3 X	0.18	=	3.86				
alls Type2	19		1.44		17.56	5 x	0.18	=	3.16				
alls Type3	11.	1	2.4		8.7	X	0.18	=	1.57				
alls Type4	2.4	ļ	0		2.4	X	0.18	=	0.43	\Box [
oof	67	,	0		67	X	0.13	=	8.71				
tal area of e	lements	, m²			131.2	2							
or windows and include the area						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragrapl	3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				35.0	62
eat capacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	1304	1.68
ermal mass	parame	ter (TMI	= Cm ÷	- TFA) iı	n kJ/m²K			Indica	tive Value	Medium		25	0
r design assess n be used instea				construct	tion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
ermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	K						6.5	66
letails of therma Ital fabric hea		are not kr	nown (36) =	= 0.05 x (3	31)			(33) +	(36) =			42.	18
entilation hea	t loss ca	alculated	d monthly	/				(38)m	= 0.33 × (25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

	()
(38)m= 37.92 37.74 37.56 36.71 36.55 35.81 35.81 35.67 36.09 36.55 36.87 37.21	(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
(39)m= 80.1 79.91 79.73 78.88 78.72 77.98 77.98 77.85 78.27 78.72 79.05 79.38	(20)
Average = Sum(39) ₁₁₂ /12= $\frac{78.88}{(40)m}$ = $\frac{(39)m \div (4)}{(40)m}$	(39)
(40)m= 1.2 1.19 1.18 1.17 1.16 1.16 1.16 1.17 1.17 1.18 1.18	
Average = $Sum(40)_{112}/12=$ 1.18 Number of days in month (Table 1a)	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.17	(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)	
(44)m= 94.34 90.91 87.48 84.05 80.62 77.19 77.19 80.62 84.05 87.48 90.91 94.34	
Total = Sum(44) ₁₋₁₂ = 1029.1	18 (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= 139.91 122.36 126.27 110.08 105.63 91.15 84.46 96.92 98.08 114.3 124.77 135.49	
Total = Sum(45) ₁₁₂ = 1349.4 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)
	(46)
(46)m= 20.99 18.35 18.94 16.51 15.84 13.67 12.67 14.54 14.71 17.15 18.72 20.32 Water storage loss:	(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$	(50)
b) If manufacturer's declared cylinder loss factor is not known:	(55)
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52) (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)

Primary circuit loss (annual) fro							0		(58)
Primary circuit loss calculated f	,	, , ,	,		r th o rm o	atat\			
(modified by factor from Table (59)m= 23.26 21.01 23.26	22.51 23.26		.26 23.26	22.51	23.26	22.51	23.26		(59)
` '		ļ .	I						` '
Combi loss calculated for each (61)m= 0 0 0	$\begin{array}{c c} month (61)m = (\\ \hline \\ 0 & 0 \end{array}$	` 	(41)m 0 0	0	0	0	0		(61)
` '						<u> </u>		(50) (04)	
Total heat required for water he			<u> </u>		,	`	· ,	(59)m + (61)m	(62)
(62)m= 186.5 164.45 172.86			1.06 143.52	143.17	160.9	169.86	182.09	I	(02)
Solar DHW input calculated using Approach (add additional lines if FGHRS					r contribut	ion to wate	er neating)		
(63)m= 0 0 0		'''		0	0	0	0		(63)
FHRS 0 0 0			0 0	0	0	0	0		(63) (G2
Output from water heater	· ·			Ü	ŭ	ŭ	Ū		() (-
(64)m= 186.5 164.45 172.86	155.17 152.22	136.24 13	1.06 143.52	143.17	160.9	169.86	182.09		
(01)1112 100.0 101.10 112.00	100.11	100.21		put from wa				1898.03	(64)
Heat gains from water heating,	kWh/month 0.25	5 ′ [0 85 v (4		•		,	l		٦, ,
(65)m= 83.79 74.35 79.26	72.68 72.4		.36 69.5	68.68	75.28	77.56	82.33	J	(65)
include (57)m in calculation								eating	
		yiii luer 13 ii i	arie aweiling	Of flot w	ater is ii	OIII COIII	indinity in	calling	
5. Internal gains (see Table 5					-			_	
Metabolic gains (Table 5), Wat Jan Feb Mar	ts Apr May	Jun	ul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56		ul Aug 3.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap					100.50	100.50	100.00		(00)
(67)m= 17.41 15.46 12.58	9.52 7.12	$\overline{}$	49 8.44	11.33	14.38	16.79	17.89		(67)
` '			<u> </u>	<u> </u>		10.75	17.00		(0.)
Appliances gains (calculated in (68)m= 190.2 192.17 187.2	176.61 163.24		2.29 140.32	145.29	155.88	169.24	181.8		(68)
` '				l .		103.24	101.0		(00)
Cooking gains (calculated in Ap (69)m= 33.86 33.86 33.86	33.86 33.86		.86 33.86	33.86	33.86	33.86	33.86		(69)
` '		33.80 33	.00 33.00	33.00	33.00	33.00	33.00		(00)
Pumps and fans gains (Table 5	, , , , , , , , , , , , , , , , , , , 						_		(70)
(70)m= 3 3 3	3 3		3 3	3	3	3	3	ı	(70)
Losses e.g. evaporation (negat	 		00.05	00.05	00.05	00.05	00.05		(71)
()	-86.85 -86.85	-86.85 -86	-86.85	-86.85	-86.85	-86.85	-86.85	I	(71)
Water heating gains (Table 5)	400 04 07 04	00.40 07	05 00 40	05.4	101.10	407.70	110.05		(72)
(72)m= 112.63 110.65 106.53	100.94 97.31		.85 93.42	95.4	101.18	107.72	110.65	I	(72)
Total internal gains =			(67)m + (68)m				i		(72)
(73)m= 378.8 376.85 364.87	345.64 326.23	307.45 29	5.2 300.74	310.58	330.01	352.32	368.92		(73)
Solar gains:Solar gains are calculated using solar	r flux from Table 6a c	and accociated	aguations to o	anyort to th	o applicat	olo orientat	ion		
Orientation: Access Factor	Area	Flux	equations to Co	g_	o applicat	FF	ЮП.	Gains	
Table 6d	m ²	Table 6	Sa T	able 6b	T	able 6c		(W)	
South 0.9x 0.77 x	5.44	x 46.75	x	0.63	x	0.7	=	77.73	(78)

	_					_					_				
South	0.9x	0.77		X	4.8	X	46.7	' 5	X	0.63	X	0.7	=	68.58	(78)
South	0.9x	0.77		X	5.44	X	76.57		X	0.63	X	0.7	=	127.3	(78)
South	0.9x	0.77		X	4.8	X	76.5	57	X	0.63	X	0.7	=	112.32	(78)
South	0.9x	0.77		x	5.44	X	97.5	53	X	0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77		x	4.8	x	97.5	53	x	0.63	X	0.7	=	143.08	(78)
South	0.9x	0.77		x	5.44	x	110.	23	X	0.63	X	0.7	=	183.27	(78)
South	0.9x	0.77		x	4.8	x	110.	23	X	0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77		X	5.44	X	114.	87	X	0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77		X	4.8	X	114.	87	X	0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77		x	5.44	x	110.	55	X	0.63	X	0.7	=	183.79	(78)
South	0.9x	0.77		x	4.8	x	110.	55	X	0.63	X	0.7	=	162.17	(78)
South	0.9x	0.77		X	5.44	X	108.	01	X	0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77		x	4.8	x	108.	01	x	0.63	X	0.7	=	158.45	(78)
South	0.9x	0.77		x	5.44	x	104.	89	X	0.63	X	0.7	=	174.39	(78)
South	0.9x	0.77		x	4.8	x	104.	89	X	0.63	X	0.7	=	153.87	(78)
South	0.9x	0.77		x	5.44	x	101.	89	x	0.63	X	0.7	=	169.39	(78)
South	0.9x	0.77		x	4.8	x	101.	89	x	0.63	X	0.7	=	149.46	(78)
South	0.9x	0.77		x	5.44	X	82.5	59	Х	0.63	X	0.7	=	137.3	(78)
South	0.9x	0.77		x	4.8	х	82.5	59	x	0.63	х	0.7	=	121.15	(78)
South	0.9x	0.77		x	5.44	х	55.4	12	x	0.63	х	0.7	=	92.13	(78)
South	0.9x	0.77		x	4.8	x	55.4	12	x	0.63	х	0.7	=	81.29	(78)
South	0.9x	0.77		x	5.44	x	40.	4	Х	0.63	х	0.7	=	67.16	(78)
South	0.9x	0.77		x	4.8	x	40.	4	X	0.63	х	0.7	=	59.26	(78)
West	0.9x	0.77		x	1.44	x	19.6	64	X	0.63	x	0.7	=	8.64	(80)
West	0.9x	0.77		x	1.44	x	38.4	12	x	0.63	X	0.7	=	16.91	(80)
West	0.9x	0.77		X	1.44	X	63.2	27	X	0.63	X	0.7	=	27.85	(80)
West	0.9x	0.77		X	1.44	x	92.2	28	X	0.63	X	0.7	=	40.61	(80)
West	0.9x	0.77		X	1.44	x	113.	09	X	0.63	X	0.7	=	49.77	(80)
West	0.9x	0.77		X	1.44	X	115.	77	X	0.63	X	0.7	=	50.95	(80)
West	0.9x	0.77		x	1.44	x	110.	22	X	0.63	X	0.7	=	48.51	(80)
West	0.9x	0.77		x	1.44	x	94.6	88	X	0.63	X	0.7	=	41.67	(80)
West	0.9x	0.77		x	1.44	X	73.5	59	X	0.63	X	0.7	=	32.39	(80)
West	0.9x	0.77		x	1.44	x	45.5	59	X	0.63	X	0.7	=	20.06	(80)
West	0.9x	0.77		x	1.44	x	24.4	19	X	0.63	X	0.7	=	10.78	(80)
West	0.9x	0.77		x	1.44	X	16.1	5	X	0.63	X	0.7	=	7.11	(80)
T				$\overline{}$	for each mon				Ė	= Sum(74)m				7	
` '	154.95	256.53	333.		385.59 409.2			86.53	369.	.93 351.23	278.5	1 184.2	133.53		(83)
Ī					$\frac{(84)m = (73)r}{734.00}$	<u> </u>				07 00 : -		n === ==	F22 :=	1	(0.4)
(84)m=	533.75	633.37	697.	95	731.22 735.4	.9 /	04.36	81.72	670.	67 661.81	608.5	2 536.52	502.45]	(84)
				•	heating seas										
-		_			eriods in the I	_			ole 9,	Th1 (°C)				21	(85)
Utilisat r				$\overline{}$	ving area, h1	T			_	-	-			1	
L	Jan	Feb	Ma	ar	Apr Ma	у	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec]	
Ot	0 4 10 004	0.1/	405	-4 /0	AD 0.02) http://									D	5 of 7

						•					•		ı	
(86)m=	0.99	0.98	0.96	0.92	0.83	0.67	0.49	0.52	0.74	0.93	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.88	20.08	20.33	20.61	20.83	20.96	20.99	20.99	20.93	20.65	20.2	19.84		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.92	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.94	19.93		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling,	h2,m (se	e Table	9a)					•	
(89)m=	0.99	0.98	0.95	0.9	0.78	0.57	0.38	0.41	0.65	0.9	0.98	0.99		(89)
Mean	interna	l temner	ature in	the rest	of dwelli	na T2 (fa	allow ste	ns 3 to	7 in Tabl	e 9c)			l	
(90)m=	18.45	18.74	19.1	19.5	19.78	19.92	19.95	19.95	19.89	19.56	18.94	18.4		(90)
` ,									f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Moon	intorno	l tompor	oturo (fo	r tha wh	ala dwa	lling) – fl	Λ Τ1	. /1 fl	۸) T2					
(92)m=	19.03	19.29	ature (fo	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(92)
									ere appro		10.40	10.00		(/
(93)m=	19.03	19.29	19.6	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(93)
	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ernal ter	nperatui	e obtain	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm											(0.4)
(94)m=	0.99	0.97	0.95	0.9	0.79	0.61	0.43	0.46	0.68	0.9	0.98	0.99		(94)
(95)m=		617,4	W = (94)	4)M X (84 654.69	581.4	429.59	291.61	305.62	453.17	548.67	523.48	497.96		(95)
			rnal tem				291.01	303.02	455.17	340.07	323.40	497.90		(33)
(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)
									L – (96)m					, ,
	1180.11		1044.63	871.6	669.77	447.95	294.18	309.17	486.44	740.03	976.5	1173.88		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m		l	
(98)m=	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2320.89	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								34.64	(99)
9a. En	erav rec	ıuiremer	nts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	CHP)					
	e heatir					, 0101110 11			,,,,					
•		_	at from se	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	-	•	ry/supple			a svstem	າ. %						0	(208)
	•							۸۰۰۵	Con	Oct	Nov	Doo		` `
Snac	Jan e heatin	Feb a require	Mar ement (c	Apr alculate	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	yeai
Opaci	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
(211)m			(4)] } x 1						-			L	I	(211)
(411)11	519.24	382.55	304.14	167.03	70.32	0	0	0	0	152.27	348.85	537.84		(211)
	·	300	I	31.00					l (kWh/yea				2482.24	(211)
									•	·	10,1012			` ′

= {[(98)m x (201)] } x 100 ÷ (208)								ı					
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_				
			Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)				
Water heating Output from water heater (calculated above)													
	36.24	131.06	143.52	143.17	160.9	169.86	182.09						
Efficiency of water heater								79.8	(216)				
(217)m= 87.25 86.83 86.13 84.83 82.75	79.8	79.8	79.8	79.8	84.49	86.53	87.39		(217)				
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m= 213.75 189.38 200.69 182.92 183.95 1	70.73	164.23	179.84	179.41	190.43	196.31	208.37		_				
Annual totals			Tota	I = Sum(2 ⁻		A/I- /		2260.02	(219)				
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 2482.24													
Water heating fuel used 2260.02													
Electricity for pumps, fans and electric keep-hot							l		_				
central heating pump:							30		(230c)				
boiler with a fan-assisted flue							45		(230e)				
Total electricity for the above, kWh/year			sum	of (230a).	(2 30g) =			75	(231)				
Electricity for lighting								307.48	(232)				
Total delivered energy for all uses (211)(221) +	(231) +	(232).	(237b)	=				5124.74	(338)				
12a. CO2 emissions – Individual heating system	s includ	ding mid	cro-CHP										
	Ene kWh	rgy n/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea					
Space heating (main system 1)	(211)	X			0.2	16	=	536.16	(261)				
Space heating (secondary)	(215)	x			0.5	19	=	0	(263)				
Water heating	(219)	x			0.2	16	=	488.16	(264)				
Space and water heating	(261)	+ (262) +	+ (263) + (264) =			[1024.33	(265)				
Electricity for pumps, fans and electric keep-hot	(231)	x			0.5	19	=	38.93	(267)				
Electricity for lighting	(232)	x			0.5	19	=	159.58	(268)				
Total CO2, kg/year				sum o	f (265)(2	271) =		1222.83	(272)				
									7				

TER =

(273)

18.25

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 67 m²

Floor 0 3 m

27.5 m² (fraction 0.41) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
DOO <mark>R</mark>	Manufacturer	Solid			Wood
E	Manufacturer	Windows	low-E, $En = 0.05$,	soft coat No	
Balcony	Manufacturer	Windows	low-E, En = 0.05 ,	soft coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Width: Type-Name: Location: Orient: Height: Name: Worst case **DOOR** INT 0 Ε East 0 0 Balcony Ε East 0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
E	29.4	8.96	20.44	0.15	0	False	N/A
INT	12	2.4	9.6	0.16	0.43	False	N/A
Spandrel	2.44	0	2.44	0.35	0	False	N/A
Roof	67	0	67	0.11	0		N/A
Internal Flements	3						

<u>Internal Elements</u>

Party Elements

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges:

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system:

Water heating:

Water heating:

None

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma	FSAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 5 (Top))			
Address :	:										
1. Overall dwelling dime	ensions:			Aro	a(m²)		Av. Ho	ight(m)		Volume(m	3)
Ground floor				Ale	• ,	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1	a)+(1b)+(1	c)+(1d)+(1e	e)+(1r	٦)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	mair heati		econdai neating	гу] + [other 0	7 = [total 0	x 4	40 =	m³ per hou	ır — _(6a)
Number of open flues		+ <u> </u>	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa		L				J		x	10 =		(7a)
						Ļ	0		10 =	0	╡`´
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	rires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimne	eys, flu <mark>es a</mark> i	nd fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l			ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	he dwelling	j (ns)						[(0)	41.04	0	(9)
Structural infiltration: 0) 25 for sto	al or timbor	frame or	0.35 fo	r macanı	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	uction			0	(11)
deducting areas of openi											_
If suspended wooden		•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er			له م ماند،							0	(13)
Percentage of window Window infiltration	s and door	s draught si	nppea		0 25 - [0 2	2 x (14) ÷ 1	001 =			0	(14)
Infiltration rate					•	+ (11) + (1	•	+ (15) =		0	(15)
Air permeability value,	a50. expre	essed in cub	ic metre	es per ho	. , , ,	. , ,	, , ,		area	3	(17)
If based on air permeabi				•	•	•			G	0.15	(18)
Air permeability value applie	•						is being us	sed			` ′
Number of sides sheltered	ed									3	(19)
Shelter factor					` ,	[0.075 x (1	[9)] =			0.78	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified		- i	1	Ι.	Ι.	T _	T -	T .	T _	1	
Jan Feb		pr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				1	1	1	1	1	1	1	
(22)m= 5.1 5	4.9 4.	4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	

0.15	0.15	0.14	0.13	0.12	0.11	0.11	(21a) x	0.12	0.12	0.13	0.14]	
alculate effec		change i		_	i -	l -					1		
If mechanica	ıl ventila	ition:										0.5	(2
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		-	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	itilation o	or positiv	e input v	ventilatio	n from o	outside					
if (22b)m	1 < 0.5 ×	(23b), t	hen (24d	c) = (23b	o); other	wise (24	c) = (22k	o) m + 0.	5 × (23b)	r	1	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural									o =1				
if (22b)m		`	<u> </u>		r `						1 .	1	(6
1d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	<u> </u>	í `	´``		`			1	1	
i)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
. Heat losses	and he	eat loss	paramete	er:									
_EMENT	Gros	SS	Openin	gs	Net Ar	ea	U-val		AXU		k-value	Э	ΑΧk
	area	(m²)	· m	12	A ,r	n²	W/m2	!K	(W/I	K)	kJ/m²-l	K	kJ/K
ors					2.4	Х	1.4	=	3.36				(2
in <mark>dows</mark> Type	1				4.16	x	1/[1/(1)+	0.04] =	4				(2
indows Type	2				4.8	X	1/[1/(1)+	0.04] =	4.62	П			(2
alls Type1	29.4	4	8.96		20.44	X	0.15] =	3.07	٦ ſ		7 6	(2
alls Type2	12		2.4		9.6	x	0.15	-	1.44	i i		7 F	(2
alls Type3	2.4	4	0		2.44	x	0.35	=	0.85	=		i i	(2
oof	67		0	=	67	x	0.11	_	7.37	=		╡	(3
tal area of e						_	0.11		1.31				
			effootivo wi	ndow I I v	110.8		formula 1	/F/1/II val	(0) (0 (04) (no airen in	norogrank		(3
or windows and Include the area						ateu using	i ioiiiiuia i	/[(1/ U- vait	1 0)+0.04] a	is giveri iri	i paragrapi	1 3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				24.7	(3
at capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	1057.7	
ermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(;
r design assess	-						ecisely the	e indicative	values of	TMP in T	able 1f		`
n be used instea	ad of a de	tailed calc	ulation.										
ermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						16.63	(3
etails of therma		are not kn	own (36) =	= 0.05 x (3	11)								
tal fabric hea									(36) =			41.33	(3
ntilation hea		i			ı	<u> </u>			= 0.33 × (25)m x (5	1	1	
1 1	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan					1 44 27	14.27	14.08	14.66	15.24	15.62	16.01	Ī	10
)m= 16.78	16.59	16.39	15.43	15.24	14.27	14.21	14.06	14.00	15.24	13.02	10.01		(3
_		<u> </u>	15.43	15.24	14.27	14.21	14.00	<u> </u>	= (37) + (37)	<u> </u>	10.01		(.

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.83	0.84	0.84	0.85	0.86		
	!					!			Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day	1	1 ` ` 	<u> </u>						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		17		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed i			se target o		5.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x			!				
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
										ım(44) ₁₁₂ =		1029.18	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,ı	m x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous w	vater heati	ing at point	of use (no	hot water	storage)	enter () in	hoxes (46		Total = Su	ım(45) ₁₁₂ =		1349.41	(45)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage		10.94	10.51	15.04	13.07	12.07	14.54	14.71	17.13	10.72	20.32		(40)
Storage volum	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		الممسمام	ft-	ممادات	/1.\^/1	- /-l -> -\ .							(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage		1			Ι		. , ,	(55) × (41)	ı				(=0)
(56)m= 32.01 If cylinder contains	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	Sv. LT	(56)
				· · ·					ını where (,HII) IS IIO		хп	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	`	,									0		(58)
Primary circuit				,	•	• •	, ,		(1.	-1-1			
(modified by			ı —	ı —	ı —			-		- 	00.00		(EO)
(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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	n month	(62)n	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.18	172.29	181.54	163.58	160.9	144.64	139.74	152.	2 151.57	169.58	178.26	190.77		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribu	tion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	18.03	16.04	16.49	14.58	14.03	12.18	11.28	12.9	4 13.08	15.09	16.32	17.54		(63) (G2)
Output	t from wa	ater hea	ter										_	
(64)m=	174.47	153.83	162.37	146.4	144.19	129.86	125.78	136.	58 135.89	151.81	159.35	170.55		_
								(Output from w	ater heate	er (annual)	112	1791.08	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	90.74	80.63	86.21	79.4	79.34	73.1	72.31	76.4	5 75.41	82.23	84.28	89.27		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelli	ng or hot w	vater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.5	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	n <mark>g g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	^r L9a), a	lso se	e Table 5					
(67)m=	18.93	16.81	13.67	10.35	7.74	6.53	7.06	9.17	12.31	15.63	18.25	19.45		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble <mark>5</mark>				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.3	32 145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)), alsc	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.8	6 33.86	33.86	33.86	33.86		(69)
Pumps	s and far	ns gains	(Table 5	āa)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					_		_	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.8	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	121.96	119.98	115.87	110.27	106.64	101.53	97.18	102.7	75 104.73	110.52	117.06	119.99		(72)
Total i	internal	gains =	1			(66)	m + (67)m	ı + (68)	m + (69)m +	(70)m + (7	71)m + (72))m		
(73)m=	386.65	384.53	372.3	352.8	333.19	314.31	302.1	307.8	317.9	337.6	360.11	376.81		(73)
6. So	lar gains	S:												
	-		•	r flux from	Table 6a		-	tions to	convert to the	he applica		tion.		
Orient	ation: A	Access F Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	T	FF able 6c		Gains (W)	
East	0.9x	0.77	X	4.1	6	x 1	9.64	x	0.4	x	0.7	=	15.85	(76)
East	0.9x	0.77	x	4.	8	x 1	9.64	х	0.4	×	0.7	<u> </u>	18.29	(76)
East	0.9x	0.77	x	4.1	6	x 3	8.42	x	0.4	x [0.7	=	31.01	(76)
East	0.9x	0.77	х	4.	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(76)
	<u>L</u>		•	•										_

	г		_						1		_				_
East	0.9x	0.77	×	4.1	16	X	6	3.27	X	0.4	×	0.7	=	51.07	(76)
East	0.9x	0.77	X	4.	8	X	6	3.27	X	0.4	X	0.7	=	58.93	(76)
East	0.9x	0.77	X	4.1	16	X	9	2.28	X	0.4	X	0.7	=	74.49	(76)
East	0.9x	0.77	X	4.	8	X	9	2.28	X	0.4	X	0.7	=	85.95	(76)
East	0.9x	0.77	X	4.1	16	X	1	13.09	X	0.4	X	0.7	=	91.29	(76)
East	0.9x	0.77	X	4.	8	X	1	13.09	X	0.4	X	0.7	=	105.33	(76)
East	0.9x	0.77	X	4.1	16	X	1	15.77	X	0.4	X	0.7	=	93.45	(76)
East	0.9x	0.77	X	4.	8	X	1	15.77	X	0.4	×	0.7	=	107.83	(76)
East	0.9x	0.77	X	4.1	16	X	1	10.22	X	0.4	X	0.7	=	88.97	(76)
East	0.9x	0.77	X	4.	8	X	1	10.22	X	0.4	X	0.7	=	102.66	(76)
East	0.9x	0.77	X	4.1	16	X	9	4.68	x	0.4	X	0.7	=	76.42	(76)
East	0.9x	0.77	X	4.	8	X	9	4.68	X	0.4	X	0.7	=	88.18	(76)
East	0.9x	0.77	X	4.1	16	X	7	3.59	X	0.4	X	0.7	=	59.4	(76)
East	0.9x	0.77	X	4.	8	X	7	3.59	X	0.4	X	0.7	=	68.54	(76)
East	0.9x	0.77	X	4.1	16	X	4	5.59	X	0.4	X	0.7	=	36.8	(76)
East	0.9x	0.77	X	4.	8	X	4	5.59	X	0.4	×	0.7	=	42.46	(76)
East	0.9x	0.77	X	4.1	16	X	2	4.49	X	0.4	X	0.7	=	19.77	(76)
East	0.9x	0.77	X	4.	8	X	2	4.49	X	0.4	X	0.7	=	22.81	(76)
East	0.9x	0.77	X	4.1	16	х	1	6.15	x	0.4	×	0.7	=	13.04	(76)
East	0.9x	0.77	x	4.	8	х	1	6.15] x	0.4	×	0.7	=	15.04	(76)
			ш						7						
Sola <mark>r g</mark>	ains in	watts, calcu	lated	for eac	h month	1			(83)m	n = Sum(74)m.	(<mark>8</mark> 2)m				
											_		1	7	
(83)m=	<mark>3</mark> 4.15		0.01	160.44	196.62		01.28	191.63	164	1.6 127.94	79.26	42.58	28.08		(83)
Total g	ains – i	nternal and	solar	(84)m =	= (73)m	+ (8	33)m	watts	I				· · · · · ·		, ,
` ' L		nternal and				+ (8			16 ⁴		79.26 416.8		28.08]	(83)
Total g	ains – i 420.8	nternal and	solar 32.31	(84)m = 513.24	= (73)m 529.81	+ (8	33)m	watts	I				· · · · · ·		, ,
Total ga (84)m= 7. Mea	ains – i 420.8 an inter	nternal and 451.33 48	solar 32.31 ature	(84)m = 513.24 (heating	529.81 season	+ (8	8 3) m 15.59	watts 493.72	472	.41 445.84			· · · · · ·	21	, ,
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature	nternal and 451.33 48 nal tempera	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in	= (73)m 529.81 season the liv	+ (8	33)m 15.59 area f	watts 493.72 from Tak	472	.41 445.84			· · · · · ·	21	(84)
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature	nternal and 451.33 48 nal temperator during heat	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in	= (73)m 529.81 season the liv	+ (8	33)m 15.59 area f	watts 493.72 from Tak	472 ole 9	.41 445.84		6 402.69	· · · · · ·	21	(84)
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature tion fac	nternal and 451.33 48 rnal temperal during heat ctor for gains	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in iving are	529.81 season the livea, h1,n	+ (8	33)m 15.59 area f ee Ta	watts 493.72 From Tab ble 9a)	472 ole 9	.41 445.84 , Th1 (°C)	416.8	6 402.69	404.89	21	(84)
Total graph (84)m= [7. Mean Temporal Utilisan (86)m= [ains – i 420.8 an inter erature tion fact Jan 1	nternal and 451.33 48 rnal temperal during heat ctor for gains	solar 32.31 ature ting p s for l Mar	(84)m = 513.24 (heating eriods in iving are Apr 0.96	529.81 season the liv ea, h1,n May	+ (8	33)m 15.59 area f ee Ta Jun 0.67	rom Tab ble 9a) Jul 0.49	472 ole 9,	.41 445.84 , Th1 (°C) ug Sep	416.8 Oc	6 402.69	404.89 Dec	21	(84)
Total graph (84)m= [7. Mean Temporal Utilisan (86)m= [ains – i 420.8 an inter erature tion fact Jan 1	nternal and 451.33 48 nal temperator for gains Feb I 0.99 0	solar 32.31 ature ting p s for l Mar	(84)m = 513.24 (heating eriods in iving are Apr 0.96	529.81 season the liv ea, h1,n May	+ (8	33)m 15.59 area f ee Ta Jun 0.67	rom Tab ble 9a) Jul 0.49	472 ole 9,	.41 445.84 , Th1 (°C) ug Sep 54 0.8	416.8 Oc	6 402.69 t Nov 0.99	404.89 Dec	21	(84)
Total graph (84)m= [7. Metalogous Temporal Utilisa (86)m= [Mean (87)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19	nternal and 451.33 48 nal temperator for gains Feb I 0.99 0	solar 32.31 ature ting p s for l Mar 0.99 re in l	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f	+ (% 5·	area f ee Ta Jun 0.67 w ste	493.72 From Take ble 9a) Jul 0.49 ps 3 to 7	472 ole 9 0.5	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95	Oc: 0.97	6 402.69 t Nov 0.99	404.89 Dec 1	21	(84)
Total graph (84)m= [7. Metalogous Temporal Utilisa (86)m= [Mean (87)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19	nternal and 451.33 48 nal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat	solar 32.31 ature ting p s for l Mar 0.99 re in l	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f	+ (8 5 5 or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or	area f ee Ta Jun 0.67 w ste	493.72 From Take ble 9a) Jul 0.49 ps 3 to 7	472 ole 9 0.5	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95 9, Th2 (°C)	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	404.89 Dec 1	21	(84)
Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m=	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2	temperature 20.29 20.22 2	solar 32.31 ature ting p s for l Mar 0.99 re in l 0.47 ting p	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21	529.81 Season the livea, h1,n May 0.86 ea T1 (frace 20.9) rest of 20.22	+ (8 5 5 n) iing m (see follo 2 2 f dw	area free Ta Jun 0.67 w stee 0.98 relling	watts 493.72 From Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23	472 A 0.57 in T 2 able 9	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95 9, Th2 (°C)	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17	21]	(84) (85) (86) (87)
Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m=	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2	nternal and 451.33 48 nal temperaturing heat stor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2	solar 32.31 ature ting p s for l Mar 0.99 re in l 0.47 ting p	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21	529.81 Season the livea, h1,n May 0.86 ea T1 (frace 20.9) rest of 20.22	+ (8 5 5 n) n) ing (see 1	area free Ta Jun 0.67 w stee 0.98 relling	watts 493.72 From Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23	472 A 0.57 in T 2 able 9	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .D, Th2 (°C) .23 20.22	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17	21]	(84) (85) (86) (87)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1	nternal and 451.33 48 nal temperate during heat extor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 extor for gains 0.99 0	solar 32.31 ature ting p s for l Mar 0.99 re in 0.47 ting p 20.2 s for r	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of di 0.94	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 0.98 relling 0.23 m (se 0.6	rom Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41	472 All 0.5 All 0.5 7 in T 2 able 9 20. 9a) 0.4	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .9, Th2 (°C) .23 20.22	Oc 0.97 20.72 20.95	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17 20.21		(84) (85) (86) (87) (88)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m= Mean	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2 tion fac 1	nternal and 451.33 48 rnal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 ctor for gains 0.99 0 I temperatu	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r	(84) m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21 eest of din 0.94 the rest	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area free Ta Jun 0.67 w stee 0.98 relling 0.63 m (see 0.6	rom Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23 ee Table 0.41 bllow ste	472 A 0.5 in T 2 able 9 0.4 0.5 20. 9a) 0.4	.41	Oc 0.97 20.72 20.95	6 402.69 t Nov 0.99 2 20.42 2 20.21	Dec 1 20.17 20.21]	(84) (85) (86) (87) (88)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1	nternal and 451.33 48 rnal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 ctor for gains 0.99 0 I temperatu	solar 32.31 ature ting p s for l Mar 0.99 re in 0.47 ting p 20.2 s for r	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of di 0.94	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 0.98 relling 0.23 m (se 0.6	rom Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41	472 All 0.5 All 0.5 7 in T 2 able 9 20. 9a) 0.4	.41 445.84 Th1 (°C) ug Sep i4 0.8 Table 9c) 1 20.95 9, Th2 (°C) 23 20.22 15 0.73 to 7 in Table 23 20.19	20.72 20.72 20.97 20.95 e 9c)	6 402.69 t Nov 0.99 2 20.42 2 20.21 0.99	Dec 1 20.17 20.21 1 19.09		(84) (85) (86) (87) (88) (89)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1 interna 19.1	nternal and 451.33 48 nal temperaturing heat extor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperature 19.25 19	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r 0.98 re in 1	(84) m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of d 0.94 the rest 19.87	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 20.98 m (se 0.6 T2 (fo	from Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41 bllow stee 20.23	472 Ai	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .9, Th2 (°C) .23 20.22 .5 0.73 .to 7 in Table .23 20.19	20.72 20.72 20.97 20.95 e 9c)	1 Nov 0.99 2 20.42 2 20.21 0.99	Dec 1 20.17 20.21 1 19.09	21	(84) (85) (86) (87) (88) (89)
Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1 interna 19.1 interna	nternal and 451.33 48 rnal temperate during heat extor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperatu 19.25 15 I temperatu	solar 32.31 ature ting p s for I Mar 0.99 re in 1 0.47 ting p 20.2 s for r 0.98 re in r 9.51	(84) m = 513.24 (heating eriods in iving are 20.71 eriods in 20.21 rest of do 0.94 the rest 19.87	(73)m 529.81 Season the livea, h1,n May 0.86 ea T1 (f 20.9 rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area free Ta Jun 0.67 w stee 0.98 relling 0.65 T2 (fo 0.22	ywatts 493.72 From Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41 bllow stee 20.23	472 AA 0.5 in T 2 able 9 0.4 ps 3 20. + (1	.41	Oc: 0.97 20.72 20.22 0.95 e 9c) 19.9 LA = Li	6 402.69 t Nov 0.99 2 20.42 2 20.21 0.99 19.46 ving area ÷ (Dec 1 20.17 20.21 1 19.09 4) =		(84) (85) (86) (87) (88) (89) (90) (91)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m=	ains – i 420.8 an inter erature etion fac Jan 1 interna 20.19 erature 20.2 tion fac 1 interna 19.1	nternal and 451.33 48 nal temperaturing heat extor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperature 19.25 19 I temperature 19.67 1	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r 0.98 re in 1 9.51	(84) m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of d 0.94 the rest 19.87 r the wh	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 20.98 m (se 0.6 T2 (fc 20.22	watts 493.72 from Tak ble 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23 ee Table 0.41 bllow ste 20.23 A × T1 20.54	472 An An An An An An An An An An An An An A	.41	0.97 20.72 20.22 0.95 e 9c) 19.9 LA = Li	1 Nov 0.99 2 20.42 2 20.21 0.99 19.46 2 19.85	Dec 1 20.17 20.21 1 19.09		(84) (85) (86) (87) (88) (89)

(00)		10.0	00.04	00.44	00.50	00.54	00.54	00.5		10.05	10.50		(93)
(93)m= 19.55 8. Space hea	19.67	19.9	20.21	20.44	20.53	20.54	20.54	20.5	20.24	19.85	19.53		(93)
Set Ti to the				e obtain	ed at ste	ep 11 of	Table 9b	o, so tha	t Ti.m=(76)m an	d re-calc	ulate	
the utilisation									, (
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	 -						i						
(94)m= 1	0.99	0.98	0.94	0.83	0.63	0.44	0.48	0.76	0.95	0.99	1		(94)
Useful gains,	1	`	<u> </u>	_	000.00	040.00	000.0	007.50	000.05	000.00	400.07		(OE)
(95)m= 418.82	447.64	473.1	483.44	442.06	323.33	218.68	228.6	337.53	396.95	398.63	403.37		(95)
Monthly aver (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										ļ	7.2		(00)
(97)m= 886.02	855.69	773.75	642.13	494.16	329.85	219.26	229.62	358.42	545.05	726.2	879.21		(97)
Space heatin	a require		r each m	nonth, k\		th = 0.02	24 x [(97)	L)m – (95		1)m	<u> </u>		
(98)m= 347.6	274.21	223.69	114.26	38.77	0	0	0	0	110.19	235.85	354.02		
	L						Tota	l per year	(kWh/yea	·) = Sum(9	8)15,912 =	1698.58	(98)
Space heatin	g require	ment in	kWh/m²	/year							[25.35	(99)
9b. Energy red	quirement	s – Cor	nmunity	heating	scheme						L		
This part is us	ed for spa	ace hea	ting, spa	ce cool	ng or wa	ater heat				unity sch	neme.		
Fraction of spa	ace heat f	rom se	condary/	supplen	nentary l	neating (Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat f	rom co	<mark>mmu</mark> nity	system	1 - (301	1) =						1	(302)
The c <mark>ommu</mark> nity se	cheme m <mark>ay</mark>	obtain he	eat from se	veral soul	ces. The p	procedure	allows for	CHP and t	up to four	other heat	sources; th	ne latter	
includes boilers, h					rom powei	r stations.	See Apper	ndix C.					7(2025)
Fraction of hea		7									Į	1	(303a)
Fraction of total	al space l	neat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for con	trol and c	harging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor (Table 1	2c) for c	ommun	ity heatir	ng syste	m					1.05	(306)
Space heating	g											kWh/yea	r
Annual space	heating re	equirem	nent									1698.58	
Space heat fro	om Comm	nunity b	oilers					(98) x (30	04a) x (30	5) x (306)	= [1783.51	(307a)
Efficiency of s	econdary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	requiren	nent froi	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =	Ī	0	(309)
Water heating	י										•		_
Annual water l	•	quirem	ent									1791.08	7
If DHW from c	•												_
Water heat fro	m Comm	unity bo	oilers					(64) x (30	03a) x (30	5) x (306)	= [1880.63	(310a)
Electricity use	d for heat	distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	36.64	(313)
Cooling Syste	m Energy	Efficie	ncy Ratio)								0	(314)
Space cooling	(if there i	s a fixe	d coolin	g system	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											r		_
mechanical ve	ntilation -	balanc	ed, extra	act or po	sitive in	out from	outside					119.54	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =		119.54	(331)
Energy for lighting (calculated in Appendix L)				334.24	(332)
Total delivered energy for all uses (307) + (309) + (310) + (312)	2) + (315) + (331) + (33	32)(237b) =		4117.92	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fackg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) If there is CHP us) ing two fuels repeat (363) to	(366) for the secon	d fuel	95	(367a)
CO2 associated with heat source 1 [(307b))+(310b)] x 100 ÷ (367b) x	0.22	=	833.11	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	852.13	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			852.13	(376)
CO2 associated with electricity for pumps and fans within dwe	lling (331)) x	0.52	=	62.04	(378)
CO2 associated with electricity for lighting	(33 2))) x	0.52	=	173.47	(379)
Total CO2, kg/year sum of (376)(382) =				1087.64	(383)
Dwelling CO2 Emission Rate (383) = (4) =				16.23	(384)
El rating (section 14)				86.99	(385)

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP	2012		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	: Sampl	е 5 (Тор)			
Address :										
1. Overall dwelling dimer	nsions:		_	4 0						
Ground floor			Are	a(m²) 67	(1a) x	Av. He	gight(m)	(2a) =	Volume(m	3) (3a
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)-	+(1e)+(1r	n)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	ry □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	.ır (6a
Number of open flues			Ⅎ ͺͰ]			20 =		= '
·		0] . F	0	J ŪĻ	0			0	(6b)
Number of intermittent far	1S				Ĺ	2		10 =	20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fir	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimney	s. flues and fans :	= (6a)+(6b)+(7	7a)+(7b)+((7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has be					continue f			. (0) =	0.1	(0)
Number of storeys in th	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.5					•	ruction			0	(11
if both types of wall are pre deducting areas of opening			tne grea	ter wall are	a (anter					
If suspended wooden fl			.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ento	er 0.05, else ente	r 0							0	(13
Percentage of windows	and doors draugh	nt stripped							0	(14
Window infiltration				0.25 - [0.2	. ,	-	(45)		0	(15
Infiltration rate	50			(8) + (10)					0	(16
Air permeability value, or If based on air permeability			•	•	•	netre of e	envelope	area	5	(17
Air permeability value applies	-					is beina u	ısed		0.35	(18
Number of sides sheltered				5	,	J			3	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.78	(20)
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.27	(21)
Infiltration rate modified for	or monthly wind sp	eed				_				
Jan Feb	Mar Apr M	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.	3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	'\m <i>-</i> 4									
	.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18]	
		0.00		1 3.02	<u> </u>	1	12	Lo	J	

0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32		
Calculate effec		•	rate for t	he appli	cable ca	se			ļ				
If mechanica												0	(23
If exhaust air h		0		, ,	,	. `	,, .	`) = (23a)			0	(2:
If balanced with		•	•	•		,						0	(23
a) If balance		i			1	- 	- ^ `	í `		` 	- ` `	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	I	(2
b) If balance	1	i			1	, , ,	i ,	í `	, 	` 		l	-
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	I	(2
c) If whole h				•	•				E (221	٥)			
$\frac{11 (220)11}{24c)m=0}$	0.5 x	0	nen (240	b) = (230)		0 0 Wise	c) = (22k)	0	.5 × (231	0	0		(2
·	<u> </u>				<u> </u>			<u> </u>					(2
d) If natural if (22b)n							on from 1 0.5 + [(2		0.5]				
24d)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(2
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	· (25)	!				
25)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(2
3. Heat losse					Not Ar		U-valı		A V I I		le volue		A V k
LEMENT	Gros area		Openin m		Net Ar A ,r		W/m2		A X U (W/		k-value kJ/m²-k		A X k kJ/K
oors					2.4	х	1	=	2.4	$\dot{\Box}$			(2
Vin <mark>dows</mark> Type	e 1				4.16	x1	/[1/(1.4)+	0.04] =	5.52	Ħ			(2
Vindows Type	2				4.8	x1.	/[1/(1.4)+	0.04] =	6.36	Ħ			(2
Valls Type1	29.	4	8.96		20.44	1 X	0.18		3.68	5 1		7 -	(2
Valls Type2	12		2.4		9.6	<u> </u>	0.18	-	1.73	-		╡╞	(2
Valls Type3	2.4		0	=	2.44	=	0.18	-	0.44	륵 ¦		╡	(2
Roof	67	_	0	_	67	^	0.13	=	8.71	-		╡	(3
otal area of e						=	0.13		0.71				
for windows and			offective wi	ndow I I-va	110.8		n formula 1	/[(1/ ₋ val	: 0.41 مراها	as aivan ir	n naraaranh	132	(3
tor windows and tinclude the area						atou using	, ioimala i	/[(ic)+0.0+j t	us giveirii	i paragrapii	J.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				28.84	(3
leat capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	1057.72	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Medium	Ī	250	(3
or design assess				construct	ion are no	t known pr	ecisely the	e indicative	e values o	f TMP in T	able 1f		
an be used inste				.a.:.a. A.:	ا بنام محمد	/					Г		—,,
hermal bridge	•	,		• .	•	٨					l	5.54	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 X (3	51)			(33) +	(36) =		[34.38	(3
entilation hea		alculated	monthly	/						(25)m x (5))	04.00	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 37.12	36.97	36.82	36.11	35.98	35.36	35.36	35.25	35.6	35.98	36.24	36.52		(3
,	<u> </u>	1 \\//k	I					(30)m	= (37) + ((38)m			
last transfor a									- 13/1+(CHARLES			
leat transfer (39)m= 71.5	71.34	71.19	70.49	70.35	69.74	69.74	69.62	69.98	70.35	70.62	70.9	ı	

leat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.06		
lumber of day	s in mor	oth (Tabl	0 10)				<u>!</u>		Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
<u> </u>								•		•			
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		17		(42)
nnual averagi educe the annua ot more that 125	e hot wa I average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)			•			
4)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
nergy content of	hot water	used - cal	culated ma	onthly -4	190 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =		1029.18	(44
5)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
139.91	122.50	120.21	110.00	103.03	91.13	04.40	90.92			m(45) ₁₁₂ =		1349.41	(45
instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46						``
6)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46
Vater storage torage torage		ípoludio	a any ca	olar or M	///IIDC	ctorago	within co	amo voc	col		450		(47
community h	,							arric ves	301		150		(47
therwise if no	_			-			, ,	ers) ente	er '0' in (47)			
/ater storage													
a) If manufacti				or is kno	wn (kWł	n/day):				1.	39		(48
emperature fa										0.	54		(49
nergy lost fro		_	-		!4		(48) x (49)) =		0.	75		(50
) If manufactedlot water stora			-								0		(51
community h	•			- (,	.,,					<u> </u>		(0)
olume factor	_										0		(52
emperature fa	actor fro	m Table	2b								0		(53
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (54) in (5	55)								0.	75		(55
/ater storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
6)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(50
cylinder contains	dedicated	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
i7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57
rimary circuit	loss (an	nual) fro	m Table	3							0		(58
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fr	om Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	a cylinde	r thermo	stat)			
•													

Combi	i loss ca	lculated	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 h	neat req	uired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		(62)
Solar DI	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	•	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
		-		-		-	-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	ude (57)	m in cald	culation o	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. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	s (Table	5), Wat	ts									_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	<mark>ig g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	18.37	16.32	13.27	10.05	7.51	6.34	6.85	8.91	11.95	15.18	17.72	18.89		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	s and fa	ns gains	(Table 5	 5a)		-	-	-		-	-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	/aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)				=	=		=	-			
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65		(72)
Total i	internal	gains =	:			(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	379.77	377.7	365.57	346.16	326.63	307.78	295.56	301.21	311.21	330.81	353.25	369.91		(73)
6. So	lar gains	S:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat		ion.		
Orient		Access F		Area		Flu		-	g_ 	_	FF		Gains	
	ļ	Table 6d		m²			ole 6a	. <u> </u>	able 6b		able 6c	<u></u>	(W)	_
East	0.9x	0.77	X	4.1	6	x 1	9.64	X	0.63	x	0.7	=	24.97	(76)
East	0.9x	0.77	х	4.8	3	x 1	9.64	х	0.63	x	0.7	=	28.81	(76)
East	0.9x	0.77	х	4.1	6	x 3	88.42	X	0.63	x	0.7	=	48.85	(76)
East	0.9x	0.77	X	4.8	3	x 3	88.42	X	0.63	X	0.7	=	56.36	(76)

East	0.9x	0.77	X	4.16	X	63.2	27	x	0.63	x	0.7		=	80.44	(76)
East	0.9x	0.77	X	4.8	X	63.2	27	X	0.63	x	0.7		=	92.82	(76)
East	0.9x	0.77	X	4.16	X	92.2	28	x	0.63	X	0.7		=	117.32	(76)
East	0.9x	0.77	X	4.8	X	92.2	28	x	0.63	x	0.7		=	135.37	(76)
East	0.9x	0.77	X	4.16	X	113	.09	x	0.63	X	0.7		=	143.78	(76)
East	0.9x	0.77	X	4.8	X	113	.09	x	0.63	X	0.7		=	165.9	(76)
East	0.9x	0.77	X	4.16	X	115	.77	x	0.63	X	0.7		=	147.18	(76)
East	0.9x	0.77	X	4.8	X	115	.77	x	0.63	x	0.7		=	169.83	(76)
East	0.9x	0.77	X	4.16	X	110	.22	x	0.63	x	0.7		=	140.13	(76)
East	0.9x	0.77	X	4.8	X	110	.22	x	0.63	x	0.7		=	161.68	(76)
East	0.9x	0.77	X	4.16	X	94.0	68	x	0.63	X	0.7		=	120.37	(76)
East	0.9x	0.77	X	4.8	X	94.0	68	x	0.63	x	0.7		=	138.88	(76)
East	0.9x	0.77	X	4.16	X	73.	59	x	0.63	x	0.7		=	93.56	(76)
East	0.9x	0.77	X	4.8	X	73.	59	x	0.63	x	0.7		=	107.95	(76)
East	0.9x	0.77	X	4.16	X	45.	59	x	0.63	X	0.7		=	57.96	(76)
East	0.9x	0.77	X	4.8	X	45.	59	x	0.63	x	0.7		=	66.88	(76)
East	0.9x	0.77	X	4.16	X	24.4	49	x	0.63	x	0.7		=	31.13	(76)
East	0.9x	0.77	X	4.8	X	24.4	49	Х	0.63	X	0.7		=	35.92	(76)
East	0.9x	0.77	x	4.16	x	16.	15	x	0.63	х	0.7		=	20.53	(76)
East	0.9x	0.77	x	4.8	х	16.	15	×	0.63	Х	0.7		=	23.69	(76)
Solar g	ains in	watts, calcul	ated	for each m	nonth		(8	83)m	= Sum(74)m	. <mark>(8</mark> 2)m					
(83)m=	53.78	105.21 173	3.26	252.69 30	9.68			83)m 259.:		.(82)m 124.84	4 67.06	44.23	3		(83)
(83)m=	53.78		3.26	252.69 30	9.68						4 67.06	44.23	3		, ,
(83)m=	53.78	105.21 173	s.26 solar	252.69 30 (84)m = (7	9.68 3 (3)m + (83)m , v	301.81 watts		25 201.51			44.23			(83) (84)
(83)m= Total g (84)m=	53.78 ains — ii 433.55	105.21 173	3.26 solar 3.83	252.69 30 (84)m = (7 598.85 63	99.68 3 (3)m + (36.31	83)m , v	301.81 watts	259.	25 201.51	124.84					, ,
(83)m= Total g (84)m= 7. Me	53.78 ains — ii 433.55 an inter	105.21 173 nternal and s 482.91 538	3.26 solar 3.83 ure (252.69 30 (84)m = (7 598.85 63 heating se	9,68 3 (3)m + (36.31 (83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	, ,
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	(84)
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat during heati tor for gains	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se eriods in the ving area,	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71 Th1 (°C)	124.84	4 420.3		14	21	(84)
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – in 433.55 an inter erature ation fac	105.21 173 nternal and s 482.91 538 nal temperat during heati tor for gains	3.26 solar 3.83 ture (ng pe for li	252.69 30 (84)m = (7 598.85 63 heating seeriods in the ving area, Apr	29,68 3 (3)m + (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (83)m , v 624.8 5 area fro	301.81 watts 597.37 om Table e 9a)	560.de 9,	25 201.51 46 512.71 Th1 (°C)	124.8- 455.6-	4 420.3	414.1	14	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	53.78 ains – ii 433.55 an inter erature ation fac Jan 1	105.21 173 nternal and s 482.91 538 nal temperate during heati tor for gains Feb M	3.26 solar 3.83 cure (ng pe for li	252.69 30 (84)m = (7 598.85 63 heating seed or in the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of t	23)m + (23)m + (236.31	area frosee Tabl Jun 0.68	01.81 vatts 597.37 cm Table e 9a) Jul 0.51	259.: 560.: le 9,	25 201.51 46 512.71 Th1 (°C) ug Sep 6 0.82	124.84 455.64	4 420.3 Nov	414.1 De	14	21	(84)
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(93)m= 19.13	19.3	19.6	19.99	20.28	20.41	20.44	20.43	20.36	19.98	19.49	19.1		(93)
8. Space hea	ting requ	uirement											
Set Ti to the					ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	ī									١		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	0.98	0.93	0.82	0.63	0.44	0.5	0.77	0.95	0.99	1	1	(94)
Useful gains,	!	ļ			0.03	0.44	0.5	0.77	0.93	0.99	'	İ	(01)
(95)m= 431.37	478.35	526.41	558.24	522.37	391.03	265.65	277.6	395.38	434.69	416.08	412.49		(95)
Monthly average								000.00		1.0.00	1.12.10	l	,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	an intern	al tempe	erature,	L Lm , W =	L =[(39)m :	x [(93)m	 – (96)m	1	ļ		l	
(97)m= 1060.36		932.66	781.63	603.7	405.41	267.51	280.88	437.95	660.12	875.06	1056.59		(97)
Space heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		l	
(98)m= 467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
							Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	2337.86	(98)
Space heatin	a require	ement in	kWh/m²	/vear								34.89	(99)
·	• .			•			:	NID)				04.00	
9a. Energy red	•	nts – Indi	viduai n	eating s	ystems i	nciuaing	micro-C	JHP)					
Space heating Fraction of sp		t from se	econdar	//supple	mentary	system						0	(201)
Fraction of sp					y		(202) = 1 -	(201) =				1	(202)
							(204) = (204)		(202)] _				╡` ′
Fraction of to							(204) = (2)	02) 🗓 [1 –	(203)] =			1	(204)
Efficiency of r												93.5	(206)
Efficiency of s	seconda	ry/supple	ementar	y heating	system	1, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin)							1	
467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
(211)m = {[(98)m x (20	4)] } x 1	00 ÷ (20	6)								-	(211)
500.5	394.55	323.26	172.02	64.72	0	0	0	0	179.37	353.44	512.52		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,101}	Ē	2500.39	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									
$= \{[(98)m \times (20)]\}$		00 ÷ (20	_			i						1	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating													
Output from w					400.04	404.00	442.50	440.47	400.0	400.00	400.00	1	
186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09	70.0	7(246)
Efficiency of w			24.04	00.50	70.0	70.0	T - 0 0		0.4.00	00.50	07.00	79.8	(216)
(217)m= 87.17	86.91	86.29	84.91	82.58	79.8	79.8	79.8	79.8	84.92	86.56	87.28	İ	(217)
Fuel for water $(219)m = (64)$	_												
(219)m = 213.95	189.22	200.33	182.75	184.34	170.73	164.23	179.84	179.41	189.46	196.24	208.63		
							Tota	I = Sum(2	19a) ₁₁₂ =	ı	ı	2259.13	(219)
Annual totals									k'	Wh/yeaı	•	kWh/year	
Space heating		ed, main	system	1						•		2500.39	
													_

Water heating fuel used				2259.13	1
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				324.5	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			5159.01	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa		Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	540.08	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	487.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1028.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	168.41	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		1235.39](272)](273)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 55.1 m²

Floor 0 3 m

26 m² (fraction 0.472) Living area: Unspecified

Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Arg <mark>on:</mark>	Frame:
DOOR	Manufactur	er Solid			Wood
W	Manufactur	er Windows	low-E, $En = 0.05$, <mark>soft</mark> coat No	
Balcony	Manufactur	er Windows	low-E, En = 0.05	, <mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. o
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
Balcony		W	West	0	0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
W	24	8.96	15.04	0.15	0	False	N/A
INT	24	2.4	21.6	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Roof	55.1	0	55.1	0.11	0		N/A
Internal Element	<u>S</u>						

Party Elements

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges:

of Openings:

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system:

Water heating:

Water heating:

None

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

			User E	Details:						
Assessor Name: Software Name:	Stroma FSAP 2	2012		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	: Sampl	е 6 (Тор)			
Address :										
Overall dwelling dimensional	nsions:			(0)						•>
Ground floor				a(m²) 55.1	(1a) x	Av. He	gight(m)	(2a) =	Volume(m)	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	·(1e)+(1r	۱)	55.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	165.3	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	'y □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	ır ── _{(6a}
Number of open flues	0 +		- - - - - - -	0	」	0	x	20 =	0	(6b
Number of intermittent far			J L		J			10 =		╡`
	15				Ļ	0			0	(7a
Number of passive vents					Ĺ	0		10 =	0	(7b
Number of flueless gas fir	es					0	X	40 =	0	(7c
								Air ch	nanges per h	our
Infiltration due to chimney	ge flues and fans -	- (6a)+(6b)+(7	7a)+(7b)+((7c) =	Г		_	÷ (5) =		(8)
If a pressurisation test has be					continue f	0 from (9) to		÷ (5) =	0	(0)
Number of storeys in th									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.					•	ruction			0	(11
if both types of wall are pro deducting areas of openin		rresponding to	the grea	ter wall are	a (after					
If suspended wooden fl		sealed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	er 0.05, else enter	0							0	(13
Percentage of windows	and doors draugh	nt stripped							0	(14
Window infiltration				0.25 - [0.2	. ,	-	>		0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the	•		•	•	•	netre of e	envelope	area	3	(17
Air permeability value applies	-					is beina u	ısed		0.15	(18
Number of sides sheltered				g. 00 a po					3	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.78	(20
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.12	(21
Infiltration rate modified for	or monthly wind sp	eed				_			-	
Jan Feb	Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a) - (22	r)m : 4									
Wind Factor $(22a)m = (22a)m = 1.27$	1)m ÷ 4 1.23 1.1 1.0	8 0.95	0.95	0.92	1	1.08	1.12	1.18]	
1.20		- 1 0.00	L 3.55	1 3.02	<u> </u>	1	12	10	I	

0.15	0.15	0.14	ng for sh 0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe		-	rate for t	he appli	cable ca	se	<u> </u>				ļ		
If mechanica												0.5	(23
If exhaust air h		0 11		, ,	,	. ,	,, .	•) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2:
a) If balance						- ` 	HR) (24a	``	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance							<u> </u>	<u> </u>	 		<u> </u>	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00l-				
<u> </u>	1 < 0.5 ×	(23b), t	nen (240	(230) = (230)	o); other	wise (24)	C) = (220)	0) M + 0.	5 × (230	0	0		(2
						<u> </u>			U	U	U		(2
d) If natural if (22b)n					ve input erwise (2				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		<u> </u>	ļ		
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse									• >/ 11				
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valu W/m2		A X U (W/I	<)	k-value kJ/m²-k		X k J/K
oors					2.4	×	1.4	= [3.36				(2
Vin <mark>dows</mark> Type	1				4.16	x	1/[1/(1)+	0.04] =	4	Ħ			(2
Vindows Type					4.8		1/[1/(1)+	L L	4.62	Ħ			(2
Valls Type1	24		8.96		15.04		0.15	=	2.26	5 ,) (2
Valls Type2	24		2.4		21.6	x	0.15		3.23	=		╡	一 `(2
Valls Type3	2.4		0	=	2.4	x	0.35		0.84	륵 ;			= \`(2
Roof	55.		0	_	55.1	x	0.11		6.06	북 ¦			(3
otal area of e						=	0.11	[0.00				
for windows and			effective wi	ndow I I-vs	105.5		ı formula 1	/[/1/ L.v.alı	ω) τΟ Ο Λ Ι ε	e aiven in	naragranh	. 2 2	(3
include the area						atou using	TOTTIGIA 1	/[(i/ O · Vaid	C)+0.0+j c	is giveri iii	paragrapii	0.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				24.37	(3
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1042.46	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium	j	250	
or design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste					ا دناه مدم ما	,					İ		— ,
hermal bridge	,	,			•	`						15.83	(3
details of therma otal fabric he		are not kn	OWII (30) =	= 0.05 X (3	1)			(33) +	(36) =			40.19	(3
entilation hea		alculated	l monthly	/					= 0.33 × (25)m x (5)))	40.13	(`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 13.8	13.64	13.48	12.69	12.53	11.74	11.74	11.58	12.06	12.53	12.85	13.17		(3
,					I	I	L			<u> </u>		l	•
ant transfer	nonfficia-	at 1/1/1/											
leat transfer of 53.99	53.83	nt, W/K 53.67	52.88	52.72	51.93	51.93	51.77	52.25	= (37) + (3 52.72	53.04	53.36		

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.98	0.97	0.96	0.96	0.94	0.94	0.94	0.95	0.96	0.96	0.97		
	!	!				!			Average =	Sum(40) ₁	12 /12=	0.96	(40)
Number of day		`							<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		84		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		7.91		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		
_						_				ım(44) ₁₁₂ =		934.88	(44)
Energy content of		used - cal					OTm / 3600						
(45)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		–
If inst <mark>antane</mark> ous w	vater heati	ng at point	of use (no	n hot water	storage).	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	_	1225.78	(45)
(46)m= 19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Water storage		17.2	10	14.55	12.72	11.01	10.21	13.50	10.07	17	10.40		(10)
Storage volum	ne (litres)	includir	ng any so	olar or <mark>V</mark>	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		oolorod l	ooo foot	or io kno		2/d0x/):							(40)
a) If manufact				oi is kiio	WII (KVVI	i/uay).					0		(48)
Temperature f							(40) (40)	\			0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage					Ι			(55) × (41)	ı				(=0)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	iv Ll	(56)
If cylinder contains										1		IA I I	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	• •	, ,		(1.	-1-1			
(modified by			ı —		ı —			-		- 	00.00		(EO)
(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)

Comb	i loss ca	lculated	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 I	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.36	161.08	169.97	153.49	151.23	136.29	132	143.32		159.11	166.83	178.35		(62)
Solar D	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	16.59	14.71	15.14	13.33	12.81	11.05	10.22	11.77	11.91	13.81	14.97	16.12	•	(63) (G2)
Outpu	t from w	ater hea	ter											
(64)m=	163.1	143.95	152.16	137.57	135.73	122.64	119.09	128.87	7 128.08	142.61	149.26	159.55		
		•				•		Ot	utput from wa	ater heate	r (annual)₁	12	1682.61	(64)
Heat o	gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	86.48	76.9	82.36	76.04	76.12	70.32	69.73	73.5	72.42	78.74	80.48	85.14		(65)
inclu	ude (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	ıs (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>tir</mark>	ng gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.29	13.58	11.05	8.36	6.25	5.28	5.7	7.41	9.95	12.63	14.74	15.72		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			•	
(68)m=	160.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooki	ng gains	(calcula	ited in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5			'	
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pump:	s and fa	ns gains	(Table 5	Ба)					•	!			ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (negat	ive valu	es) (Tab	le 5)			•	•	•		1	
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	[(71)
Water	heating	gains (T	able 5)						•				ı	
(72)m=	116.23	114.43	110.7	105.62	102.32	97.67	93.73	98.78	100.58	105.84	111.78	114.44		(72)
Total	internal	gains =				(66)	m + (67)m	+ (68)n	n + (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m=	342.57	340.73	330.26	313.56	296.88	280.66	270.06	275.17	7 283.69	300.57	319.89	334.13		(73)
6. So	lar gains	S:												
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu			g _	_	FF		Gains	
		Table 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
West	0.9x	0.77	X	4.1	6	x 1	9.64	х	0.4	x	0.7	=	15.85	(80)
West	0.9x	0.77	X	4.8	8	x 1	9.64	х	0.4	x	0.7	=	18.29	(80)
West	0.9x	0.77	X	4.1	6	x 3	8.42	x	0.4	x	0.7	=	31.01	(80)
West	0.9x	0.77	X	4.8	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(80)

			_					_						
West	0.9x	0.77	X	4.16	x	6	3.27	X	0.4	X	0.7	=	51.07	(80)
West	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	x	0.7	=	58.93	(80)
West	0.9x	0.77	X	4.16	Х	g	92.28	X	0.4	X	0.7	=	74.49	(80)
West	0.9x	0.77	X	4.8	X	9	92.28	X	0.4	X	0.7	=	85.95	(80)
West	0.9x	0.77	x	4.16	х	1	13.09	X	0.4	x	0.7	=	91.29	(80)
West	0.9x	0.77	x	4.8	х	1	13.09	X	0.4	X	0.7	=	105.33	(80)
West	0.9x	0.77	x	4.16	x	1	15.77	x	0.4	X	0.7	=	93.45	(80)
West	0.9x	0.77	X	4.8	х	1	15.77	X	0.4	X	0.7	=	107.83	(80)
West	0.9x	0.77	x	4.16	х	1	10.22	X	0.4	X	0.7	=	88.97	(80)
West	0.9x	0.77	x	4.8	х	1	10.22	x	0.4	x	0.7	=	102.66	(80)
West	0.9x	0.77	X	4.16	х	9	94.68	x	0.4	X	0.7	=	76.42	(80)
West	0.9x	0.77	x	4.8	х	9	94.68	X	0.4	X	0.7	=	88.18	(80)
West	0.9x	0.77	x	4.16	x	7	73.59	x	0.4	x	0.7	=	59.4	(80)
West	0.9x	0.77	x	4.8	x	7	73.59	x	0.4	x	0.7		68.54	(80)
West	0.9x	0.77	x	4.16	x	4	15.59	x	0.4	X	0.7		36.8	(80)
West	0.9x	0.77	x	4.8	×	4	15.59	x	0.4	X	0.7		42.46	(80)
West	0.9x	0.77	x	4.16	x	2	24.49	x	0.4	x	0.7		19.77	(80)
West	0.9x	0.77	x	4.8	X	2	24.49	Х	0.4	X	0.7	=	22.81	(80)
West	0.9x	0.77	x	4.16	×	1	6.15	x	0.4	х	0.7	_	13.04	(80)
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	x	0.7	_ =	15.04	(80)
								7						
				Company of the	a makla			(00)	0 (74)	(00)				
Solar g	ains in	watts, calcul	ated	for each m	ionth			(83)m	$n = Sum(74)m \dots$.(8Z)m			_	
Solar g (83)m=	ains in 34.15		ated 0.01			201.28	191.63	(83)m 164		79.26		28.08		(83)
(83)m=	34.15		0.01	160.44	6.62		191.63	`			_	28.08		(83)
(83)m=	34.15	66.8 110 nternal and s	0.01	160.44 19 (84)m = (7	96.62 (3)m +		191.63	`	1.6 127.94		42.58	28.08 362.21		(83) (84)
(83)m= Total g	3 <mark>4.15</mark> ains — ii 376.72	66.8 110 nternal and s	0.01 solar 0.27	160.44 19 (84)m = (7 474 4	96.62 (3)m + 93.5	(83)m	191.63 , watts	164	1.6 127.94	79.26	42.58			, ,
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(83)m= Total g (84)m= 7. Mea Temp Utilisa (86)m= Mean (87)m= Utilisa (89)m= Mean (90)m= Mean	ains – ii 376.72 an inter erature tion fac Jan 1 interna 20.07 erature 20.1 tion fac 0.99 interna 18.87	66.8 110 Internal and s 407.53 440 Inal temperal during heatifor for gains Feb N 0.99 0. I temperatur 20.19 20 during heatifor for gains 0.99 0. I temperatur 19.03 19 I temperatur 19.03 19	o.01 solar one of ture (one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of th	160.44	98.62 (3)m + 93.5 (ason) e living h1,m (May 0.85 (T1 (foll) 0.88 (est of d) 0.12 (ling, h2) 0.8 (dwellin) 20 (e) dwellin	(83)m 481.94 y area f see Ta Jun 0.66 ow ste 20.98 welling 20.13 2,m (se 0.58 g T2 (for 20.12	191.63 , watts 461.69 from Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.13 ee Table 0.4 ollow ste 20.13	164 439 All 0.5 7 in T 20. 9a) 0.4 eps 3 20.	1.6 127.94 1.77 411.64 1.77 411.64 1.77 411.64 1.77 411.64 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70	79.26 379.8 Oct 0.96 20.68 20.12 0.94 e 9c) 19.75 A = Li	3 362.47 Nov 0.99 2 20.11 0.99 19.26 ving area ÷ (-	Dec 1 20.06 20.11 1 18.85 4) =	21	(84) (85) (86) (87) (88) (89) (90) (91)
(83)m= Total g (84)m= 7. Mean (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	an interestion factors of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of 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month of the month of the month of the month of the month of the month of the month of the month of the month of the month of the month of the month of the month of t	0.01	160.44	26.62 23)m + 93.5 2800) e living h1,m (May 0.85 T1 (foll 0.88 est of d 0.12 lling, h2 0.8 dwellin 20 c dwellin 0.41	(83)m 481.94 y area f see Ta Jun 0.66 ow ste 20.98 welling 20.13 2,m (se 0.58 g T2 (for 20.12	191.63 , watts 461.69 from Table 9a) Jul 0.49 ps 3 to 7 21 from Table 20.13 ee Table 0.4 collow stee 20.13 LA × T1 20.54	164 439 ble 9 0.5 7 in T 20. 9a) 0.4 eps 3 20. + (1 20.	1.6 127.94 1.77 411.64 1.77 411.64 1.77 411.64 1.77 411.64 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 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379.8 Oct 0.96 20.68 20.12 0.94 e 9c) 19.75 A = Li	3 362.47 Nov 0.99 2 20.11 0.99 19.26 ving area ÷ (-	Dec 1 20.06 20.11 1	21	(84) (85) (86) (87) (88) (89)

(93)m= 19.44	19.58	19.83	20.17	20.41	20.52	20.54	20.54	20.49	20.19	19.76	19.42		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		l					_ 3						
(94)m= 0.99	0.99	0.98	0.93	0.82	0.62	0.44	0.48	0.75	0.95	0.99	0.99		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m	•								
(95)m= 374.3	403.06	429.5	441.63	405.39	299.4	203.63	212.72	309.59	359.08	357.76	360.31		(95)
Monthly aver		r		from Ta	r e								
(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	1				i	- ,	· · ·	<u> </u>		074.70			(07)
(97)m= 817.25	790.13	715.57	595.82	459.34	307.59	204.56	214.28	333.61	505.4	671.72	812.02		(97)
Space heatin (98)m= 329.56	g require 260.12	212.84	111.02	40.14	/vn/mon	$\ln = 0.02$	24 X [(97))m – (95 0)m] X (4 108.86	226.05	336.07		
(90)111= 329.30	200.12	212.04	111.02	40.14		0		l per year		l .	Ь——	1624.65	(98)
0			1.10/1- / 0	1/			Tota	i per year	(KVVII/yeai) = Sum(9	O)15,912 —		= ' '
Space heatin	g require	ement in	KVVN/M²	/year							L	29.49	(99)
9b. Energy red				Ĭ									
This part is us Fraction of spa							.	•		unity sch	neme.	0	(301)
							(Table I	1) 0 11 11	OHE				=
Fraction of spa					•							1	(302)
The c <mark>ommu</mark> nity so includes boilers, h									up to four	other heat	sources; th	ne latter	
Fraction of hea					iom powor	Glations.	occ / ippoi	idix O.				1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) = [1	(304a)
Factor for con						r commu	unity hea	iting sys		_, (/ [1	(305)
Distribution los	ss factor	(Table 1	2c) for o	commun	itv heatii	na svste	m				[1.05	(306)
Space heating		()	,		,	3 - 7					L	kWh/yea	
Annual space	_	requiren	nent								[1624.65	<u>'</u>
Space heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	- [1705.88	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/suլ	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =	Ī	0	(309)
Water heating	3										_		_
Annual water l	neating r	equirem	ent									1682.61	
If DHW from c Water heat fro								(64) x (30	03a) x (30	5) x (306) :	= [1766.74	(310a)
Electricity use	d for hea	ıt distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	34.73	(313)
Cooling Syste	m Energ	y Efficie	ncy Ratio	0							ĺ	0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans v	within dv	velling (1	Γable 4f)	:					L		<u> </u>
mechanical ve							outside					98.31	(330a)
											_		=

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	(98.31	(331)
Energy for lighting (calculated in Appendix L)			2	70.05	(332)
Total delivered energy for all uses (307) + (309) + (310) + (31	2) + (315) + (331) + (33	32)(237b) =	3	840.99	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		sions 02/year	
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us) ing two fuels repeat (363) to	(366) for the second f	uel	95	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	789.57	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	18.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	-	807.59	(373)
CO2 associated with space heating (secondary)	(309) x	0	-	0	(374)
CO2 associated with water from immersion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			807.59	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x	0.52	=	51.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	140.16	(379)
Total CO2, kg/year sum of (376)(382) =				998.77	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				18.13	(384)
El rating (section 14)				86.63	(385)

				User D	etails:						
Assessor Name:	Ctromo I	-CAD 201	0		Strom				Versia	on: 1 0 F F1	
Software Name:	Stroma	FSAP 201		roporty	Softwa		rsion: e 6 (Top	\	versic	n: 1.0.5.51	
Address :			Г	Toperty	Address	. Заттріє	e 6 (10p)			
1. Overall dwelling dime	ensions:										
				Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor				,	55.1	(1a) x		3	(2a) =	165.3	(3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	n) =	55.1	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:											
	main heatin		econdar neating	ry	other		total			m³ per hoι	ır
Number of chimneys	0	+ [0	7 + [0	=	0	X e	40 =	0	(6a
Number of open flues	0	-	0	-	0	ī = Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans						2	x	10 =	20	(7a
Number of passive vents	5					F	0	x	10 =	0	二 (7b)
Number of flueless gas f						F	0	X ·	40 =	0	(7c)
garage garage						L					(, 0,
									Air ch	nanges <mark>per</mark> he	our
Infilt <mark>ration</mark> due to chi <mark>mne</mark>	ys, flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b			ed, procee	ed to (17),	otherwise (continue fr	rom (9) to	(16)			_
Number of storeys in t Additional infiltration	he dwelling	(ns)						[(0)	410.4	0	(9)
Structural infiltration: 0) 25 for steel	or timber	frame o	. 0.35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10
if both types of wall are p						•	dollon			0	('''
deducting areas of openi				4 / 1							_
If suspended wooden		•	led) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en Percentage of window	,		trinned							0	(13
Window infiltration	3 and doors	draugitt 3	пррси		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16
Air permeability value,	q50, expres	sed in cut	oic metre	es per ho	our per s	quare m	etre of e	envelope	area	5) (17
lf based on air permeabi	lity value, th	en (18) = [(1	7) ÷ 20]+(8), otherw	ise (18) =	(16)				0.37	(18
Air permeability value applie		ation test ha	s been doi	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed				(20) = 1 -	[0 075 x (1	19\1 –			3	(19
Infiltration rate incorpora	ting shaltar t	actor			(20) = 1 (21) = (18)		10)] =			0.78	= (20
Infiltration rate modified t	•		4		(-1) - (10	, ^ (20) =				0.29	(21
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1 5411	1 541	1 , 149	<u> </u>	1 000	1 1101	1 200	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		
	<u> </u>		1	1	1	l .	1	1	ı	I	
Wind Factor (22a)m = (2		1				I				1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.37	ation rat	0.35	0.32	0.31	0.27	0.27	0.27	0.29	0.31	0.32	0.34		
Calculate effec							0.27	0.23	0.01	0.52	0.54		
If mechanica											[0	(23
If exhaust air h		0 11		, ,	, ,	. `	,, .	•) = (23a)			0	(23
If balanced with		-	•	_								0	(23
a) If balance						<u> </u>	- ` ` - 	<u> </u>	 	- 	- ` 	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance							<u> </u>	<u> </u>	- ` `	<u> </u>			10.
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				-	-				F (00h	. \			
if (22b)n 24c)m= 0	1 < 0.5 ×	(23b), t	nen (240	(23D) 0	o); otnerv	wise (24	C) = (220)	0) m + 0.	5 × (230	0	0		(24
,				_					0				(2-
d) If natural if (22b)n									0.5]				
24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25
3. Heat losse					N . A				A >< 1.1				\/ I
ELEMENT	Gros area		Openin		Net Ar A ,r		U-valu W/m2		A X U (W/I	K)	k-value kJ/m²-k		X k J/K
Doors					2.4	x	1	= [2.4				(26
Nindows Type	1				4.16	x1.	/[1/(1.4)+	0.04] =	5.52	Ħ			(27
Nindows Type					4.8		/[1/(1.4)+	L L	6.36	Ħ			(27
Nalls Type1	24		8.96	_	15.04		0.18	=	2.71	≒		7	(29
Walls Type2	24		2.4	=	21.6	X	0.18		3.89			╣	(29
Walls Type3	2.4		0	=						믁 ¦		┪┝═	(29
Roof				=	2.4	=	0.18	=	0.43	륵 ¦		╣	=
	55.		0		55.1	x	0.13	=	7.16				(30
Γotal area of e for windows and			ffoctivo wi	ndow II ve	105.5		ı formula 1	/[/1/ L volu	(0) 1 0 041 6	ne givon in	naraaranh	2.2	(3
* include the area						ateu using	i ioiiiiuia i	/[(1/ U- valu	(C)+0.04] a	is giveir iii	i paragrapri	3.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				28.47	(3:
Heat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	1042.46	(34
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Medium	Ī	250	(3
	ments wh	ere the de	tails of the	constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
or design assess		tailed calcı	ılation.			,					г		_
an be used inste						<					Ĺ	5.28	(3
can be used inste Thermal bridge	es : S (L	x Y) cal		• .	•	`							
can be used inste Thermal bridge f details of therma	es : S (L al bridging	x Y) cal		• .	•	`		(33) +	(36) =		Γ	33 74	
can be used inste Thermal bridge f details of therma Total fabric he	es : S (L al bridging at loss	x Y) cal	own (36) =	= 0.05 x (3	•	`			(36) = = 0.33 × (25)m x (5	[33.74	(37
can be used inste Thermal bridge f details of therma Total fabric he /entilation hea	es:S(L al bridging at loss at loss ca	x Y) cal	own (36) =	= 0.05 x (3	1)		Aua	(38)m	= 0.33 × (33.74	(37
For design assess can be used inste Thermal bridge f details of therma Total fabric he Ventilation hea Jan 38)m= 30.94	es : S (L al bridging at loss	x Y) cal	own (36) =	= 0.05 x (3	•	Jul 29.31	Aug 29.2			25)m x (5 Nov 30.13	Dec 30.39	33.74	(37
Fan be used instermal bridger feetails of thermal fotal fabric head of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the fee	es : S (L al bridging at loss at loss ca Feb 30.8	x Y) calcare not known alculated Mar 30.66	own (36) = monthly Apr	- 0.05 x (3 / May	Jun	Jul	-	(38)m Sep 29.53	= 0.33 × (Oct 29.88	Nov 30.13	Dec	33.74	
can be used inste Thermal bridge f details of therma Total fabric he Ventilation hea	es : S (L al bridging at loss at loss ca Feb 30.8	x Y) calcare not known alculated Mar 30.66	own (36) = monthly Apr	- 0.05 x (3 / May	Jun	Jul	-	(38)m Sep 29.53	= 0.33 × (Nov 30.13	Dec	33.74	

Heat loss para	meter (l	-II D\ \Λ//	/m²K					(40)m	= (39)m ÷	. (4)			
(40)m= 1.17	1.17	1.17	1.16	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16		
(40)1112	1.17	1.17	1.10	1.10	1.17	1.14	1.14			Sum(40) ₁ .		1.16	(40)
Number of day	s in mo	nth (Tab	le 1a)					•	rtvorage =	Cum(40)	12712-	1.10	(,
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
							ļ	ļ	ļ.	!			
4 \0/-4											1-) 0 //- /		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		84		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.91		(43)
										<u> </u>			
Jan Hot water usage in	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
			ı			1	· <i>′</i>	I		T	I 1		
(44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		—
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b. 1		934.88	(44)
	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
(45)m= 127.09	111.15	114.7	100	95.95	62.6	76.72	00.04					1005.70	(45)
If instantaneous w	ater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		10tai = Su	m(45) ₁₁₂ =		1225.78	(43)
(46)m= 19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Water storage		7 -		-									, ,
Storage volum	e (litres)) includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			C Z (KVV	ii/iiti G/GC	(y)					0		(31)
Volume factor	_		011 110								0		(52)
Temperature fa	actor fro	m Table	2b							—	0		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_									75		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains												ix H	,
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	- 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	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 I	loss cal	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)	ım						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		(62)
Solar DH	W 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 ad	ditional	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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	134.18	150.42	158.43	169.67		_
								Οι	utput from wa	ater heate	r (annual)₁	12	1774.4	(64)
Heat ga	ains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	79.53	70.63	75.41	69.32	69.18	63.6	62.79	66.55	65.7	71.8	73.76	78.2		(65)
includ	de (57)r	n in calc	culation o	of (65)m	only if o	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a):									
Metabo	lic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>ting</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	14.88	13.21	10.74	8.13	6.08	5.13	5.55	7.21	9.68	12.29	14.34	15.29		(67)
Applian	i <mark>ce</mark> s gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	16 0.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooking	g gains	(calcula	ited in A	pendix	L, equat	ion L15	or L15a)	, also	see Table	5				
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61		(71)
Water h	neating	gains (T	able 5)											
(72)m=	106.9	105.1	101.36	96.28	92.98	88.34	84.39	89.45	91.25	96.5	102.44	105.11		(72)
Total in	nternal	gains =	1			(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	'1)m + (72)	m		
(73)m=	335.82	334.02	323.62	307	290.37	274.19	263.57	268.63	3 277.09	293.89	313.16	327.36		(73)
6. Sola	ar gains	:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		ccess Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
West	_							-					` '	7,000
West	0.9x	0.77	X	4.1		-	9.64	X	0.63		0.7	=	24.97	(80)
West	0.9x	0.77	x	4.8			9.64	X	0.63		0.7	=	28.81	(80)
West	0.9x	0.77	X	4.1		-	88.42	X	0.63	x	0.7	=	48.85	(80)
44G91	0.9x	0.77	Х	4.8	В	x 3	88.42	X	0.63	x	0.7	=	56.36	(80)

West	0.9x	0.77	X	4.16	X	6	3.27	x	0.63	x	0.7	=	80.44	(80)
West	0.9x	0.77	x	4.8	X	6	3.27	X	0.63	x	0.7	=	92.82	(80)
West	0.9x	0.77	x	4.16	X	9	92.28	x	0.63	x	0.7	=	117.32	(80)
West	0.9x	0.77	X	4.8	X	9	92.28	x	0.63	x	0.7	=	135.37	(80)
West	0.9x	0.77	х	4.16	X	1	13.09	X	0.63	x	0.7	=	143.78	(80)
West	0.9x	0.77	х	4.8	X	1	13.09	x	0.63	x	0.7		165.9	(80)
West	0.9x	0.77	x	4.16	X	1	15.77	x	0.63	x	0.7	=	147.18	(80)
West	0.9x	0.77	x	4.8	X	1	15.77	x	0.63	x	0.7	=	169.83	(80)
West	0.9x	0.77	х	4.16	X	1	10.22	x	0.63	x	0.7		140.13	(80)
West	0.9x	0.77	x	4.8	X	1	10.22	x	0.63	x	0.7	=	161.68	(80)
West	0.9x	0.77	x	4.16	X	9	94.68	X	0.63	x	0.7	=	120.37	(80)
West	0.9x	0.77	x	4.8	X	9	94.68	X	0.63	x	0.7	=	138.88	(80)
West	0.9x	0.77	х	4.16	X	7	73.59	x	0.63	×	0.7	=	93.56	(80)
West	0.9x	0.77	х	4.8	X	7	73.59	x	0.63	x	0.7	=	107.95	(80)
West	0.9x	0.77	x	4.16	x	4	15.59	x	0.63	×	0.7	=	57.96	(80)
West	0.9x	0.77	x	4.8	x	4	15.59	x	0.63	x	0.7	=	66.88	(80)
West	0.9x	0.77	х	4.16	X	2	24.49	x	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	x	4.8	X	2	24.49	Х	0.63	X	0.7	=	35.92	(80)
West	0.9x	0.77	x	4.16	x	1	6.15	x	0.63	x	0.7		20.53	(80)
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.63	x	0.7		23.69	(80)
								7						
Solar g	ains in	watts, calcu	lated	for each mo	nth			(83)m	n = Sum(74)m	(8 <mark>2</mark>)m				
Solar g (83)m=	ains in 53.78		ated 3.26	for each mo 252.69 309		317.01	301.81	(83)m 259	<u> </u>	<mark>(82)m</mark> 124.8	_	44.23]	(83)
(83)m =	53.78	105.21 17:	3.26		.68		301.81 , watts	`	<u> </u>		_	44.23		(83)
(83)m =	53.78	105.21 173 nternal and	3.26	252.69 309	.68)m +			`	.25 201.51		4 67.06	44.23 371.59]	(83) (84)
(83)m= Total games (84)m=	53.78 ains — ii 389.6	105.21 173 nternal and 3 439.23 490	3.26 solar 5.88	252.69 309 (84)m = (73	.68)m + .05	(83)m	, watts	259	.25 201.51	124.8	4 67.06	<u> </u>]	
(83)m= Total games (84)m= 7. Mea	53.78 ains — ii 389.6 an inter	105.21 173 nternal and s 439.23 490 nal tempera	3.26 solar 5.88 ture (252.69 309 (84)m = (73 559.69 600	.68)m + .05 son)	(83)m 591.2	, watts 565.38	259 527	.88 478.6	124.8	4 67.06	<u> </u>	21	
(83)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate (84)m= Total graduate	53.78 ains — ii 389.6 an inter	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309 (84)m = (73 559.69 600 (heating sea	.68)m + .05 son)	(83)m 591.2	, watts 565.38 from Tab	259 527	.88 478.6	124.8	4 67.06	<u> </u>	21	(84)
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	9.04 (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 the utilisation factor for gains using Table 9a	e-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains, hm:	500
(94)m= 0.99 0.99 0.97 0.91 0.79 0.6 0.43 0.48 0.75 0.94 0.99	.99 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	9.48 (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	1.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 955.18 926.41 842.45 707.2 546.66 367.27 242.68 254.72 396.54 596.52 788.88 9	1.45 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
Total per year (kWh/year) = Sum(98)-	912 = 2097.63 (98)
Space heating requirement in kWh/m²/year	38.07 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1 (204)
Efficiency of main space heating system 1	93.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec kWh/year
Space heating requirement (calculated above)	
422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
	3.09
Total (kWh/year) =Sum(211) _{15,1012} =	2243.46 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)]} x 100 ÷ (208)	
(215)m= 0 0 0 0 0 0 0 0 0 0 0	0
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)
Water heating	
Output from water heater (calculated above)	
	9.67
Efficiency of water heater	79.8 (216)
	7.21 (217)
Fuel for water heating, kWh/month	
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 199.41 176.5 187.19 171.23 172.91 160.26 154.53 168.72 168.15 177.37 183.21 172.91 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183$	4.56
Total = Sum(219a) ₁₁₂ =	2114.03 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	- NVVIII y Cai
opace ricating faci asea, main system i	2243.46

					_
Water heating fuel used				2114.03	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				262.71	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4695.2	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	484.59	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	456.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			941.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	136.34	(268)
Total CO2, kg/year TER =	sum	n of (265)(271) =		20.26	(272)

SAP Input

Property Details: Sample 7 (Top)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height:

Floor 0 66.3 m² 3 m

Living area: 23 m² (fraction 0.347)

Front of dwelling faces: Unspecified

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	F <mark>rame</mark> :
DOOR	Manufactur	er Solid			Wood
Balcon	y Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	
N	Manufactur	er Windows	low-E, En = 0.05	s, soft coat No	
E	Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:		
DOOR	mm	0.7	0	1.4	2.4	1		
Balcony		0.7	0.4	1	4.8	1		
N		0.7	0.4	1	5.44	1		
F		0.7	0.4	1	1.44	1		

Name: DOOR	Type-Name:	Location:	Orient: Worst case	Width: 0	Height: 0
Balcony		N	North	0	0
N		N	North	0	0
E		Е	East	0	0

Overshading: Heavy

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Eleme	<u>ents</u>						
N	10.24	10.24	0	0.15	0	False	N/A
E	1.44	1.44	0	0.15	0	False	N/A
INT	13.2	2.4	10.8	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Roof	66.3	0	66.3	0.11	0		N/A

Internal Elements
Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20			Strom Softwa	are Ve	rsion:		Versio	on: 1.0.5.51	
		Р	roperty	Address	Sample	e 7 (Top)			
Address: 1. Overall dwelling dime	onsions:									
1. Overall dwelling diffe	511310113.		Δre	a(m²)		Δv He	eight(m)		Volume(m	3)
Ground floor					(1a) x		3	(2a) =	198.9) (3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	66.3	(4)			_		
Dwelling volume		-,	′	00.0)+(3c)+(3c	d)+(3e)+	(3n) =	198.9	(5)
							, , ,		190.9	(0)
2. Ventilation rate:		secondar	у	other		total			m³ per hou	ır
Number of chimneys	heating	heating 0	7 + [0	7 = [0	X	40 =	0	(6a
Number of open flues	0 +	0	┧╻┝	0]	0	x	20 =	0	(6b)
·			_	0	J L			10 =		╡`
Number of intermittent fa					L	0			0	(7a)
Number of passive vents					L	0		10 =	0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c
								Δir ch	nanges per h	our
Infiltration due to chimne	vs. fluor and fans – ((6a)+(6b)+(7	7a)+(7h)+(70) -			_			_
If a pressurisation test has b					continue fi	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0					•	ruction			0	(11
if both types of wall are p deducting areas of openi	resent, use the value corre nas): if equal user 0.35	esponding to	the great	ter wall are	a (after					
If suspended wooden	• / .	aled) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en	ter 0.05, else enter 0								0	(13
Percentage of window	s and doors draught :	stripped							0	(14
Window infiltration				0.25 - [0.2					0	(15
Infiltration rate				(8) + (10)	. , , ,	, , ,	, ,		0	(16
Air permeability value,	•		•	•	•	etre of e	envelope	area	3	(17
If based on air permeabil Air permeability value applie	•					is boing u	isod		0.15	(18
Number of sides sheltere		as been doi	ie oi a ueț	gree an pe	ппеаышу	is being u	iseu		2	(19
Shelter factor	-			(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorpora	ting shelter factor			(21) = (18) x (20) =				0.13	(21
Infiltration rate modified f	or monthly wind spec	ed								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a) (2	2)m : 4									
Wind Factor $(22a)m = (2(22a)m = 1.27)$	2)m ÷ 4 1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(220)111- 1.21 1.20	1.20 1.1 1.00	0.95	0.90	0.82	<u>'</u>	1.00	1.12	1.10]	

djusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	_	_		•	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
<i>Calculate effec</i> If mechanica		•	rate for t	пе аррп	cable ca	Se						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				79.05	
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)		
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	иV) (24b	m = (22)	2b)m + (23b)		ı	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho				•	•				5 × (23b))	•	_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v					•				0.5]			ı	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)		•		•	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss r	paramet	er:							_	_	
LEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
oo <mark>rs</mark>					2.4	X	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				4.8	x	1/[1/(1)+	0.04] =	4.62				(27
Vindows Type	2				5.44	x	1/[1/(1)+	0.04] =	5.23	П			(27
Vindows Type	3				1.44	x	1/[1/(1)+	0.04] =	1.38	5			(27
Valls Type1	10.2	24	10.2	4	0	X	0.15	i	0				(29
Valls Type2	1.4	4	1.44		0	X	0.15	-	0				(29
Valls Type3	13.2	2	2.4		10.8	x	0.15	<u> </u>	1.62	F i		7 F	(29
Valls Type4	2.4		0		2.4	x	0.35	<u> </u>	0.84	F i		7 F	(29
Roof	66.3	3	0		66.3	x	0.11	<u> </u>	7.29	=		7 F	(30
otal area of el	ements	, m²			93.58								(3
for windows and i						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				24.34	(33
eat capacity (Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	781.5	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assessi an be used instea	d of a de	tailed calc	ulation.				recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						14.04	(3
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			38.38	(3
entilation hea	t loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))		
												_	

	1	·	i			i	ı				•	l	4
(38)m= 17.55	17.34	17.13	16.08	15.87	14.83	14.83	14.62	15.24	15.87	16.29	16.71		(38)
Heat transfer		· ·	1			1		· · ·	= (37) + (I	
(39)m= 55.92	55.71	55.5	54.46	54.25	53.2	53.2	52.99	53.62	54.25	54.67	55.09		7 (20)
Heat loss par	ameter (I	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	54.41	(39)
(40)m= 0.84	0.84	0.84	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83		_
Number of da	vs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.82	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•	•								•	•	'	
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ	unancv	N									45		(40)
if TFA > 13 if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		.15		(42)
Annual avera	ge hot wa										5.34		(43)
Reduce the annu	•		0 ,		•	Ū	to achieve	a water us	se target o	f		'	
			<u> </u>			<u> </u>	Aug	Con	Oct	Nov	Doo		
Jan Hot water usage	in litres per	Mar r day for ea	Apr ach month	May $Vd, m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 93.87	90.46	87.04	83.63	80.22	76.8	76.8	80.22	83.63	87.04	90.46	93.87		
(11)	300	0,101	00.00	00.22	1 0.0		00.22			m(44) ₁₁₂ =		1024.02	(44)
Ener <mark>gy cont</mark> ent o	f hot wa <mark>ter</mark>	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	OTm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.2	121.75	125.63	109.53	105.1	90.69	84.04	96.44	97.59	113.73	124.14	134.81		_
If instantaneous	water heati	na at noint	of use (no	hot water	storage)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1342.66	(45)
(46)m= 20.88	18.26	18.85	16.43	15.76	13.6	12.61	14.47	14.64	17.06	18.62	20.22		(46)
Water storage	1	10.05	10.43	13.70	13.0	12.01	14.47	14.04	17.00	10.02	20.22		(10)
Storage volun	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	•			•			` '						
Otherwise if n		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		eclared I	oss facto	or is kno	wn (kWh	n/dav):					0		(48)
Temperature					`	, , ,					0		(49)
Energy lost from				ear			(48) x (49)	=			10		(50)
b) If manufac			-										
Hot water sto	•			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community Volume factor	•		on 4.3							1	.03		(52)
Temperature			2b							-	0.6		(52)
Energy lost from	om water	r storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		.03		(54)
Enter (50) or		_	,				, , , , ,	, , ,	•		.03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = (55) × (41)r	m			•	
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fron	m Table 3							0		(58)
Primary circuit loss calculated for		59)m = (5	58) ÷ 365	× (41)ı	m				•	
(modified by factor from Table	H5 if there is s	olar wate	er heating	g and a	cylinder	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 calculated for each r	month (61)m = ((60) ÷ 365	5 × (41)m	n						
(61)m= 0 0 0	0 0	0	0	0	0	0	0	0		(61)
Total heat required for water hea	ating calculated	for each	month (6	62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.48 171.68 180.91	163.02 160.37	144.18	139.32	151.71	151.08	169.01	177.64	190.09		(62)
Solar DHW input calculated using Apper	ndix G or Appendix	H (negative	e quantity)	(enter '0'	if no solar	contribut	ion to wate	r heating)		
(add additional lines if FGHRS a	and/or WWHRS	applies,	see Appe	endix G	6)					
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0		(63)
FHRS 17.95 15.97 16.42	14.51 13.97	12.12	11.22	12.87	13.02	15.02	16.25	17.46		(63) (G2
Output from water heater										
(64)m= 173.85 153.29 161.81	145.92 143.72	129.47	125.41	136.16	135.46	151.3	158.8	169.95		
		-	-	Outp	ut from wa	ater heate	r (annual) ₁	12	1785.13	(64)
Heat gains from water heating, k	kWh/month 0.25	5´[0.85 ×	< (45)m +	⊦ (61)m] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.51 80.42 85.99	79.21 79.17	72.95	72.16	76.29	75.24	82.04	84.07	89.05		(65)
include (57)m in calculation of	f (65)m only if cy	ylinder is	in the dv	velling	or hot wa	ate <mark>r is</mark> fi	rom com	munity h	eating	
5. Internal gains (see Table 5	and 5a):									
Metabolic gains (Table 5), Watts	6									
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 107.65 107.65 107.65	107.65 107.65	107.65	107.65	107.65	107.65	107.65	107.65	107.65		(66)
Lighting gains (calculated in App	oendix L, equati	on L9 or	L9a), als	o see T	Table 5					
(67)m= 17.67 15.69 12.76	9.66 7.22	6.1	6.59	8.56	11.49	14.59	17.03	18.16		(67)
Appliances gains (calculated in A	Appendix L, equ	uation L1:	3 or L13a	a), also	see Tal	ole 5			•	
(68)m= 188.51 190.47 185.54	175.04 161.8	149.35	141.03	139.07	144	154.5	167.74	180.19		(68)
Cooking gains (calculated in App	pendix L, equati	ion L15 o	r L15a),	also se	e Table	5			•	
(69)m= 33.77 33.77 33.77	33.77 33.77	33.77	33.77	33.77	33.77	33.77	33.77	33.77		(69)
Pumps and fans gains (Table 5a	a)	=	=	-	-		-		•	
(70)m= 0 0 0	0 0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporation (negative	ve values) (Tab	le 5)	-				•		•	
(71)m= -86.12 -86.12 -86.12	-86.12 -86.12	-86.12	-86.12	-86.12	-86.12	-86.12	-86.12	-86.12		(71)
Water heating gains (Table 5)		-	-				-		•	
(72)m= 121.65 119.68 115.58	110.02 106.41	101.32	97	102.54	104.5	110.26	116.77	119.69		(72)
Total internal gains =		(66)m	n + (67)m +	+ (68)m +	(69)m + (70)m + (7	'1)m + (72)	m	•	
(73)m= 383.12 381.13 369.18	350.02 330.72	312.06	299.91	305.47	315.3	334.65	356.84	373.33		(73)
6. Solar gains:			•	·						
Solar gains are calculated using solar f	flux from Table 6a a	and associa	ted equation	ons to co	nvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux		-	g_	-	FF		Gains	
Table 6d	m²	ıabı	le 6a		able 6b	, , –	able 6c		(W)	_
North 0.9x 0.77 x	4.8	x 10	.63	X	0.4	x	0.7	=	9.9	(74)

North	0.9x	0.77	X	5.44	X	10.6	3	X	0.4	x	0.7	=	11.22	(74)
North	0.9x	0.77	X	4.8	X	20.3	2	x	0.4	x	0.7	=	18.93	(74)
North	0.9x	0.77	X	5.44	X	20.3	2	x	0.4	х	0.7	=	21.45	(74)
North	0.9x	0.77	X	4.8	X	34.5	3	x	0.4	x	0.7	=	32.16	(74)
North	0.9x	0.77	x	5.44	X	34.5	3	x	0.4	x	0.7	_ =	36.45	(74)
North	0.9x	0.77	x	4.8	×	55.4	6	x	0.4	x	0.7		51.66	(74)
North	0.9x	0.77	X	5.44	x	55.4	6	x	0.4	x	0.7	=	58.55	(74)
North	0.9x	0.77	x	4.8	x	74.7	2	x	0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	x	5.44	×	74.7	2	x	0.4	x	0.7		78.87	(74)
North	0.9x	0.77	X	4.8	x	79.9	9	x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	x	5.44	x	79.9	9	x	0.4	x	0.7		84.43	(74)
North	0.9x	0.77	x	4.8	×	74.6	8	x	0.4	x	0.7	=	69.55	(74)
North	0.9x	0.77	X	5.44	x	74.6	8	x	0.4	x	0.7	=	78.83	(74)
North	0.9x	0.77	X	4.8	x	59.2	5	x	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	X	5.44	X	59.2	5	x	0.4	x	0.7	=	62.54	(74)
North	0.9x	0.77	X	4.8	x	41.5	2	x	0.4	×	0.7	=	38.67	(74)
North	0.9x	0.77	X	5.44	X	41.5	2	x	0.4	x	0.7	=	43.82	(74)
North	0.9x	0.77	X	4.8	X	24.1	9	Х	0.4	Х	0.7	=	22.53	(74)
North	0.9x	0.77	j×	5.44	j x	24.1	9	х	0.4	x	0.7		25.53	(74)
North	0.9x	0.77	X	4.8	х	13.1	2	×	0.4	х	0.7	=	12.22	(74)
North	0.9x	0.77	×	5.44	X	13.1	2	x	0.4	x	0.7	=	13.85	(74)
North	0.9x	0.77	j×	4.8	x	8.86		Х	0.4	x	0.7		8.26	(74)
North	0.9x	0.77	x	5.44	x	8.86	5 /	Х	0.4	х	0.7	_ =	9.36	(74)
East	0.9x	0.77	X	1.44	х	19.6	4	x	0.4	x	0.7		5.49	(76)
East	0.9x	0.77	X	1.44	×	38.4	2	x	0.4	x	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.44	X	63.2	7	x	0.4	x	0.7	=	17.68	(76)
East	0.9x	0.77	X	1.44	X	92.2	8	x	0.4	×	0.7	=	25.78	(76)
East	0.9x	0.77	j x	1.44	X	113.0	9	x	0.4	x	0.7	=	31.6	(76)
East	0.9x	0.77	X	1.44	×	115.7	77	x	0.4	×	0.7	=	32.35	(76)
East	0.9x	0.77	X	1.44	X	110.2	22	x	0.4	x	0.7		30.8	(76)
East	0.9x	0.77	j x	1.44	X	94.6	8	x	0.4	x	0.7	=	26.45	(76)
East	0.9x	0.77	X	1.44	X	73.5	9	X	0.4	×	0.7	= =	20.56	(76)
East	0.9x	0.77	X	1.44	X	45.5	9	X	0.4	x	0.7	= =	12.74	(76)
East	0.9x	0.77	X	1.44	X	24.4	9	X	0.4	×	0.7	=	6.84	(76)
East	0.9x	0.77	X	1.44	X	16.1	5	X	0.4	×	0.7	= =	4.51	(76)
	_		_		_									_
Solar g	ains in v	watts, calcu	lated	for each mon	th		((83)m	ı = Sum(74)m	(82)m				
(83)m=	26.62	51.11 86	5.29	135.99 180.0	6 1	91.28 17	79.18	144	.17 103.05	60.8	32.91	22.13		(83)
Total ga	ains – ir	ternal and	solar	(84)m = (73) r	n + (83)m , w	atts						•	
(84)m=	84)m= 409.74 432.25 455.47 486.01 510.78 503.34 479.08 449.64 418.35 395.45 389.75 395.46 (84)													
7. Mea	7. Mean internal temperature (heating season)													
Tempe	erature	during heat	ing pe	eriods in the li	ving	area fror	m Tab	le 9,	Th1 (°C)				21	(85)
Utilisa	tion fact	tor for gains	for li	ving area, h1	,m (s	ee Table	9a)					<u></u>		_
	Jan	Feb N	Лar	Apr Ma	у	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
Stroma F	SAP 2011	2 Version: 1 0	5 51 (9	SAP 9 92) - http:/	/\^\^\	etroma coi	m						Page	5 of 7

(86)m= 1	1	0.99	0.96	0.86	0.66	0.49	0.54	0.81	0.97	0.99	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m= 20.21	20.3	20.47	20.71	20.9	20.99	21	21	20.95	20.73	20.44	20.2		(87)
Temperature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
(88)m= 20.22	20.22	20.22	20.23	20.24	20.25	20.25	20.25	20.25	20.24	20.23	20.23		(88)
Utilisation fac	ctor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)		-	-	-		
(89)m= 1	0.99	0.99	0.95	0.82	0.59	0.4	0.45	0.75	0.96	0.99	1		(89)
Mean interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)			•	
(90)m= 19.16	19.29	19.53	19.89	20.14	20.24	20.25	20.25	20.21	19.92	19.5	19.15		(90)
	•	•			•	•		1	LA = Livin	g area ÷ (4) =	0.35	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	A) x T2					
(92)m= 19.52	19.64	19.86	20.17	20.41	20.5	20.51	20.51	20.47	20.2	19.83	19.52		(92)
Apply adjustr	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate			l	
(93)m= 19.52	19.64	19.86	20.17	20.41	20.5	20.51	20.51	20.47	20.2	19.83	19.52		(93)
8. Space hea	iting requ	uirement											
Set Ti to the					ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	-			iviay	Juli	Jui	Aug	Seb	Oct	INOV	Dec		
(94)m= 1	0.99	0.98	0.95	0.83	0.61	0.43	0.48	0.77	0.96	0.99	1		(94)
Us <mark>eful g</mark> ains,	hmGm	, W = (94	4)m x (8	4)m	<u> </u>								
(95)m= 407.88	429.08	447.99	460.21	425.51	309	207.61	217.04	321.2	378.12	385.99	394.01		(95)
Monthly aver	_	rnal tem									1		
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	1	1		1	1	- ` ´ ´ 		_ ` <i></i>	ī	005.74	040.00	Ī	(07)
(97)m= 851.32		741.41	614	472.37	313.96	208.03	217.86	341.42	520.76	695.74	843.66		(97)
Space heatin	1	218.31	110.73	34.86	0	0.02	0	0	106.12	223.02	334.54		
(**)									(kWh/year			1620.95	(98)
Space heatin	a requir	ament in	k\/\/h/mi	2/vear				7 - 7	(),	, (-	7	24.45	(99)
·	• •											24.45	(00)
9b. Energy red This part is us							ing prov	idad by	o oomm	unity ool	nomo		
Fraction of spa			• .		•		.	•		urilly Sci	ienie.	0	(301)
Fraction of spa	ace heat	from co	mmunity	svstem	1 – (30	1) =						1	(302)
The community so			•	•	,	,	allows for	CHP and I	un to four	other heat	sources: t		(11)
includes boilers, h									ар то тош т	ourior riodi	0001000, 1	no lattor	
Fraction of hea	at from (Commun	ity boile	s								1	(303a)
Fraction of total	al space	heat fro	m Comr	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	(2c) for (commun	itv heatii	na svste	m					1.05	(306)
		(,		.,	5 5,0.0	-						
Space heating Annual space	-	requirem	nent									kWh/ye 1620.95	aı
		10011										1020.00	

Space heat from Community boilers	(98) x (304a) x (305) x (306) =	1701.99 (307a)
Efficiency of secondary/supplementary heating system	n % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplement	ary system (98) x (301) x 100 ÷ (308) =	0 (309)
Water heating Annual water heating requirement		1785.13
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1874.39 (310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310	De)] = 35.76 (313)
Cooling System Energy Efficiency Ratio		0 (314)
Space cooling (if there is a fixed cooling system, if not e	nter 0) = (107) ÷ (314) =	0 (315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in	ut from outside	118.3 (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) =	118.3 (331)
Energy for lighting (calculated in Appendix L)		311.98 (332)
Total delivered energy for all uses (307) + (309) + (310)	+ (312) + (315) + (331) + (332)(237b) =	4006.66 (338)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	kWh/year kg CO2/kWh	
CO2 from other sources of space and water heating (no	kWh/year kg CO2/kWh	n kg CO <mark>2/yea</mark> r
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the seco	n kg CO2/year
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%) CO2 associated with heat source 1	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x 0.22	n kg CO2/year and fuel 95 (367a) = 813.16 (367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x 0.22	h kg CO2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second [(307b)+(310b)] x 100 ÷ (367b) x 0.22 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0	kg CO2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372) = 831.72 (373)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the seco [(307b)+(310b)] x 100 ÷ (367b) x	kg CO2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372) = 831.72 (373) = 0 (374)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the secondary of the second	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x	kg CO 2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372) = 831.72 (373) = 0 (374) = 0 (375)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instituted to the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second (367b) x 0.22 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 tantaneous heater (312) x 0.22	kg CO 2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372) = 831.72 (373) = 0 (374) = 0 (375) 831.72 (376)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instituted to the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x	kg CO 2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372) = 831.72 (373) = 0 (374) = 0 (375) 831.72 (376) = 61.4 (378)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instituted to the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of	kWh/year kg CO2/kWh CHP) CHP using two fuels repeat (363) to (366) for the second (307b)+(310b)] x 100 ÷ (367b) x	kg CO 2/year and fuel 95 (367a) = 813.16 (367) = 18.56 (372) = 831.72 (373) = 0 (374) = 0 (375) 831.72 (376) = 61.4 (378) = 161.92 (379)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	2		Strom Softwa				Versic	on: 1.0.5.51	
		Pi	operty.	Address	: Sampl	е 7 (Тор)			
Address :										
1. Overall dwelling dime	nsions:									
Ground floor				a(m²) 66.3	(1a) x	Av. He	gight(m)	(2a) =	Volume(m ²	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)	+(1n) (66.3	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	198.9	(5)
2. Ventilation rate:										
Number of chimneys		condargeating	у 7 + Г	other 0	7 = F	total 0	x	40 =	m³ per hou	ır
Number of open flues]]			20 =		닠`
•		0	J ' L	0] - [0			0	(6t
Number of intermittent far	ns				Ĺ	2		10 =	20	(7a
Number of passive vents					L	0	X	10 =	0	(7t
Number of flueless gas fin	res					0	X ·	40 =	0	(70
								Δir ch	nanges per he	our
Infiltration due to object	to fluor and fano (63)	a) ı (7b) ı (70) -			_			
Infilt <mark>ration due to chimney</mark> If a pressurisation test has be					continue f	20 from (9) to		÷ (5) =	0.1	(8)
Number of storeys in th		a, procee	- 10 (17),	ouror moo (10111 (0) 10	(70)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.	25 for steel or timber f	rame or	0.35 fo	r masonı	y const	ruction			0	(1
if both types of wall are pr deducting areas of openin	resent, use the value correspons): if equal user 0.35	onding to	the great	ter wall are	a (after					
If suspended wooden f		ed) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	ter 0.05, else enter 0								0	(13
Percentage of windows	and doors draught str	ipped							0	(14
Window infiltration				0.25 - [0.2	. ,	-			0	(15
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16
Air permeability value,	·		•	•	•	netre of e	envelope	area	5	(17
f based on air permeabili	-					. :- 6 - :			0.35	(18
Air permeability value applie. Number of sides sheltere		been aon	e or a deg	gree air pe	rmeability	r is being u	sea		2	(19
Shelter factor	u .			(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporat	ing shelter factor			(21) = (18) x (20) =				0.3	(21
Infiltration rate modified for	or monthly wind speed									
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7	·				•			•	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
All 15-11 (00) (22				•		•	-	•	•	
Wind Factor (22a)m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m =	' 	0.05	0.05	0.00	4	1.00	1 40	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				•	
0.38	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
Calculate effect If mechanica			rate for t	пе арріі	саріе са	ise						0	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	heat recov	ery: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mechar	nical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	_	`
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mechar	nical ve	ntilation	without	heat red	covery (N	лV) (24b	m = (22)	2b)m + (2	23b)		l	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse extr			•	•				.5 × (23b))		•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilatior n = 1, ther				•				0.5]	•	•	1	
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		(24
Effective air	change ra	ate - er	nter (24a) or (24k	o) or (24	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		(2
3. Heat losse	s and hea	et loss r	paramete	jr.					_			_	
ELEMENT	Gross		Openin		Net Ar	ea	U-val	ue	AXU		k-value		AXk
	are <mark>a (</mark> ı	m²)	m	2	A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>					2.4	X	1		2.4				(2
Vindows Type	: 1				4.8	x1	/[1/(1.4)+	0.04] =	6.36	Ų			(2
Vindows Type	2				5.44	x1	/[1/(1.4)+	0.04] =	7.21	Ц			(2
Vindows Type	3				1.44	х1	/[1/(1.4)+	0.04] =	1.91				(2
Valls Type1	10.24		10.24	4	0	X	0.18	=	0				(2
Valls Type2	1.44		1.44		0	X	0.18	=	0				(2
Valls Type3	13.2		2.4		10.8	X	0.18	=	1.94	\Box [(2
Valls Type4	2.4		0		2.4	X	0.18	=	0.43				(2
Roof	66.3		0		66.3	X	0.13	=	8.62				(3
otal area of e	lements,	m²			93.58	3						_	(3
for windows and						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions		(26) (20) . (22) _					
abric heat los		,	U)				(26)(30	, , ,	(20) : (20	2) . (22-)	(20-)	28.88	
leat capacity	•	,	. Cm	T[. l. 1/m21/				(30) + (32	, , ,	(32e) =	781.5	
hermal mass or design assess	•	•		,			ecisaly the		tive Value		ahle 1f	250	(3
an be used instea				JOHSHUCL	ion ale 110	. KIOWII PI	ooiseiy uit	, maicanyt	, vaiu c s Ul	rivii III I (abic II		
hermal bridge	es : S (L x	(Y) cal	culated (using Ap	pendix I	K						4.68	(3
details of therma		re not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he									(36) =			33.56	(3
entilation hea	at loss cal		l monthly	/	1				= 0.33 × (25)m x (5)) 	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

						i	i			ī	i	1	
,	37.37	37.19	36.34	36.19	35.45	35.45	35.31	35.73	36.19	36.51	36.84	I	(38)
Heat transfer co								· · · ·	= (37) + (3			l	
(39)m= 71.11	70.93	70.75	69.9	69.74	69.01	69.01	68.87	69.29	69.74	70.07	70.4	60.0	(39)
Heat loss param	neter (F	ILP), W/	m²K						= (39)m ÷	Sum(39) ₁ (4)	12 / 1 Z=	69.9	(39)
(40)m= 1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.04	1.05	1.05	1.06	1.06		-
Number of days	in mor	nth (Tabl	e 1a)					/	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heatin	ng ener	gy requi	rement:								kWh/ye	ear:	
Assumed occup	ancv. N	N								2	15		(42)
if TFA > 13.9, if TFA £ 13.9,	N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		10		(/
Annual average	hot wa										.34		(43)
Reduce the annual a	-		• •		-	-	to achieve	a water us	e target o	f			
Jan	Feb		,			Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in l		Mar day for ea	Apr ach month	Vd,m = fa	Jun		Aug (43)	Sep	Oct	INOV	Dec		
(44)m= 93.87	90.46	87.04	83.63	80.22	76.8	76.8	80.22	83.63	87.04	90.46	93.87		
									Γotal = Su	L m(44) ₁₁₂ =		1024.02	(44)
Energy content of ho	ot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		_
(45)m= 139.2	121.75	125.63	109.53	105.1	90.69	84.04	96.44	97.59	113.73	124.14	134.81		_
If instantaneous wat	ter heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =	=	1342.66	(45)
	18.26	18.85	16.43	15.76	13.6	12.61	14.47	14.64	17.06	18.62	20.22		(46)
Water storage lo		.0.00								10.02			` ,
Storage volume	(litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	_			_			, ,	.	(0): (47)			
Otherwise if no s Water storage lo		not wate	er (tnis in	iciuaes i	nstantar	neous co	mbi boli	ers) ente	er o'in (47)			
a) If manufactur		eclared le	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Temperature fac	ctor fro	m Table	2b							0.	54		(49)
Energy lost from	n water	storage	, kWh/ye	ear			(48) x (49)	=		0.	75		(50)
b) If manufactur			-									1	(= 4)
Hot water storage If community her				e z (KVVI	n/iitre/da	ıy)					0	i	(51)
Volume factor from	_										0		(52)
Temperature fac	ctor fro	m Table	2b								0		(53)
Energy lost from	n water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (54	4) in (5	55)								0.	75		(55)
Water storage lo	oss cal	culated f	or each	month			((56)m = (55) × (41)r	n				
` '	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	<u> </u>	(56)
If cylinder contains d	dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	()m = (56)	m where (H11) is fro	m Append	ıx H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	I	(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated t		59)m = (58) ÷	365 × (41))m				ı	
(modified by factor from Table	le H5 if there is	solar water he	ating and a	a cylinde	r thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23.2	6 23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (41)m						
(61)m= 0 0 0	0 0	0 0	0	0	0	0	0		(61)
Total heat required for water he	eating calculated	l for each mor	th (62)m =	: 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 185.8 163.83 172.23	154.62 151.69	135.78 130.6		142.68	160.32	169.24	181.41		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative qua	ntity) (enter '0	' if no sola	r contribut	ion to wate	r heating)	1	
(add additional lines if FGHRS	and/or WWHRS	applies, see	Appendix (3)					
(63)m= 0 0 0	0 0	0 0	0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0 0	0	0	0	0	0	ı	(63) (G2
Output from water heater									
(64)m= 185.8 163.83 172.23	154.62 151.69	135.78 130.6	3 143.03	142.68	160.32	169.24	181.41	1	
			Out	out from wa	ater heate	r (annual)₁	12	1891.27	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (45)m + (61)n	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	1	
(65)m= 83.56 74.15 79.05	72.49 72.22	66.23 65.2	2 69.34	68.52	75.09	77.35	82.1		(65)
include (57)m in calculation	of (65)m only if c	ylinder is in th	e dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat									
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 107.65 107.65 107.65	107.65 107.65	107.65 107.6	5 107.65	107.65	107.65	107.65	107.65		(66)
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or L9a)	, also see	Table 5				•	
(67)m= 17.23 15.3 12.44	9.42 7.04	5.94 6.42	8.35	11.21	14.23	16.61	17.7		(67)
Appliances gains (calculated in	Appendix L, eq	uation L13 or	. L13a), also	see Tal	ble 5			ı	
(68)m= 188.51 190.47 185.54	175.04 161.8	149.35 141.0	3 139.07	144	154.5	167.74	180.19		(68)
Cooking gains (calculated in A	ppendix L, equat	tion L15 or L1	5a), also s	ee Table	5			I	
(69)m= 33.77 33.77 33.77	33.77 33.77	33.77 33.7	7 33.77	33.77	33.77	33.77	33.77		(69)
Pumps and fans gains (Table 5	5a)	<u> </u>		•	ı			I	
(70)m= 3 3 3	3 3	3 3	3	3	3	3	3		(70)
Losses e.g. evaporation (negative	tive values) (Tab	le 5)			Į.	!		I	
(71)m= -86.12 -86.12 -86.12	-86.12 -86.12	-86.12 -86.1	2 -86.12	-86.12	-86.12	-86.12	-86.12		(71)
Water heating gains (Table 5)	l l	<u> </u>				Į.		I	
(72)m= 112.31 110.34 106.25	100.68 97.07	91.98 87.6	6 93.2	95.17	100.93	107.43	110.35		(72)
Total internal gains =	I I	(66)m + (6	7)m + (68)m ·	+ (69)m + ((70)m + (7	1)m + (72)	m	1	
(73)m= 376.35 374.41 362.53	343.44 324.21	305.57 293.4	1 298.92	308.67	327.95	350.08	366.55		(73)
6. Solar gains:									
Solar gains are calculated using sola	r flux from Table 6a	and associated e	quations to co	onvert to th	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux		g_		FF		Gains	
Table 6d	m²	Table 6a	Т	able 6b	T	able 6c		(W)	
North 0.9x 0.77 x	4.8	x 10.63	x	0.63	x	0.7	=	15.6	(74)

	_								_						
North	0.9x	0.77)	(5.44	X	10.63	3	X	0.63	X	0.7	=	17.68	(74)
North	0.9x	0.77	,	· [4.8	X	20.32	2	X	0.63	X	0.7	=	29.81	(74)
North	0.9x	0.77)	· [5.44	X	20.32)	x	0.63	X	0.7	=	33.78	(74)
North	0.9x	0.77)	· [4.8	x	34.53	3	X	0.63	X	0.7	=	50.65	(74)
North	0.9x	0.77)	ζ [5.44	x	34.53	3	x	0.63	X	0.7	=	57.41	(74)
North	0.9x	0.77	,	, [4.8	x	55.46	5	X	0.63	x	0.7	=	81.36	(74)
North	0.9x	0.77)	(5.44	x	55.46	6	x	0.63	X	0.7	=	92.21	(74)
North	0.9x	0.77)	(4.8	x	74.72)	x	0.63	X	0.7	=	109.6	(74)
North	0.9x	0.77)	(5.44	x	74.72	2	x	0.63	X	0.7	=	124.22	(74)
North	0.9x	0.77)	(4.8	x	79.99)	x	0.63	X	0.7	=	117.33	(74)
North	0.9x	0.77)	(5.44	x	79.99)	x	0.63	X	0.7	=	132.98	(74)
North	0.9x	0.77)	(4.8	x	74.68	3	x	0.63	X	0.7	=	109.55	(74)
North	0.9x	0.77)	(5.44	x	74.68	3	X	0.63	x	0.7	=	124.15	(74)
North	0.9x	0.77)	· [4.8	x	59.25	5	X	0.63	x	0.7	=	86.91	(74)
North	0.9x	0.77	,	, [5.44	x	59.25	5	X	0.63	x	0.7	=	98.5	(74)
North	0.9x	0.77)	(4.8	x	41.52	2	X	0.63	x	0.7	=	60.9	(74)
North	0.9x	0.77	,	, [5.44	x	41.52)	x	0.63	x	0.7	=	69.02	(74)
North	0.9x	0.77	,	(4.8	X	24.19)	Х	0.63	X	0.7	=	35.48	(74)
North	0.9x	0.77	,	([5.44	х	24.19		x	0.63	x	0.7		40.22	(74)
North	0.9x	0.77	,	([4.8	х	13.12	2 /	x	0.63	x	0.7	=	19.24	(74)
North	0.9x	0.77	,	(5.44	x	13.12		X	0.63	x	0.7	=	21.81	(74)
North	0.9x	0.77	,	([4.8	x	8.86		Х	0.63	x	0.7	=	13	(74)
North	0.9x	0.77	,	([5.44	×	8.86		X	0.63	x	0.7	=	14.74	(74)
East	0.9x	0.77	,	([1.44	х	19.64	. /	x	0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77	,	, <u> </u>	1.44	x	38.42)	x	0.63	x	0.7	=	16.91	(76)
East	0.9x	0.77	,	· [1.44	x	63.27	,	x	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77	,	· [1.44	x	92.28	3	x	0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77	,	, [1.44	x	113.0	9	x	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	,	, [1.44	x	115.7	7	x	0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77	,	, [1.44	x	110.2	2	x	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	,	, [1.44	x	94.68	3	x	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	,	, [1.44	x	73.59)	x	0.63	x	0.7		32.39	(76)
East	0.9x	0.77	,	, [1.44	x	45.59)	x	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	,	, [1.44	x	24.49)	x	0.63	x	0.7	=	10.78	(76)
East	0.9x	0.77	,	, [1.44	x	16.15	5	x	0.63	x	0.7	=	7.11	(76)
	_			-											_
Solar g	ains in	watts, ca	lculate	d f	or each mont	th			(83)m	= Sum(74)m	(82)m			_	
(83)m=	41.92	80.5	135.91		214.19 283.59			32.2	227	.08 162.31	95.76	51.83	34.85		(83)
Ī				Ť	84)m = (73) m	<u> </u>			ı					1	
(84)m=	418.27	454.91	498.43		557.63 607.8	6	06.83 57	5.61	525	99 470.98	423.7	401.91	401.39		(84)
7. Mea	7. Mean internal temperature (heating season)														
Tempe	Temperature during heating periods in the living area from Table 9, Th1 (°C)														
Utilisa <u></u>	tion fac	tor for ga	ains for	liv	ving area, h1,	m (s	ee Table	9a)				_			
	Jan	Feb	Mar		Apr May	/	Jun .	Jul	A	ug Sep	Oct	Nov	Dec		
01	0 4 D 004	0.1/	40554	رم	AD 0.02\ h#n://			_						D	5 of 7

													ı	
(86)m=	1	1	0.99	0.96	0.87	0.69	0.52	0.59	0.85	0.98	0.99	1		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.89	20.01	20.23	20.55	20.83	20.96	20.99	20.99	20.89	20.55	20.17	19.87		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	20.02	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.03		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)				-		
(89)m=	1	0.99	0.99	0.95	0.82	0.6	0.41	0.47	0.78	0.96	0.99	1		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	na T2 (fa	ollow ste	ens 3 to	7 in Tahl	e 9c)				
(90)m=	18.55	18.72	19.05	19.51	19.87	20.03	20.05	20.05	19.95	19.51	18.97	18.53		(90)
									l f	LA = Livin	g area ÷ (4	4) =	0.35	(91)
Moor	intorno	l tompor	oturo (fo	r tha wh	ala dwa	lling\ — fl	Λ Τ1	. /1 fl	۸) T2					
(92)m=	19.01	19.17	ature (fo	19.87	20.2	20.35	20.38	20.37	20.28	19.87	19.38	18.99		(92)
			he mean			<u> </u>		<u> </u>			10.00	10.00		(-)
(93)m=	19.01	19.17	19.46	19.87	20.2	20.35	20.38	20.37	20.28	19.87	19.38	18.99		(93)
	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ternal ter	nperatui	e obtair	ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u	tilisation	factor fo	or gains	using Ta	ble 9a								ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.00	0.00	0.45		0.0	0.00	0.00	4		(04)
(94)m=	1	0.99	0.98	0.94	0.83	0.63	0.45	0.51	0.8	0.96	0.99	1		(94)
(95)m=			, W = (94 489.45	526.23	506.4	382.38	258.62	269.85	377.5	407.76	398.32	399.9		(95)
			rnal tem				230.02	209.00	377.5	407.70	390.32	399.9		(30)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	e for me	ı an intern		erature.	L	L =[(39)m :	L x [(93)m			<u> </u>			
	1046.39		916.77	766.93	592.98	396.91	260.53	273.62	428.11	646.74	860.71	1041.48		(97)
Spac	e heatin	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=	468.76	376.71	317.92	173.3	64.42	0	0	0	0	177.8	332.92	477.33		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2389.15	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year								36.04	(99)
9a. En	erav rec	uiremer	nts – Indi	vidual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatir					,			,					
•		_	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Effici	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	-	•	ry/suppl			a svstem	າ. %						0	(208)
								۸۰۰۵	Con	Oot	Nov	Doo		`
Snac	Jan e heatin	Feb a require	Mar ement (c	Apr	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	y c ai
Opac	468.76	376.71	317.92	173.3	64.42	0	0	0	0	177.8	332.92	477.33		
(211)n			(4)] } x 1			<u> </u>		<u> </u>	L				I	(211)
(<u>~ 1 1)</u> [[501.34	402.9	340.02	185.35	68.89	0	0	0	0	190.16	356.06	510.51		(211)
									l (kWh/yea				2555.24	(211)

Space heating fuel (secondary), kWh/month								
= {[(98)m x (201)] } x 100 ÷ (208)								
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
		Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	"	0	(215)
Water heating								_
Output from water heater (calculated above)	105 70 1 400 6	22 442.02	140.00	400.00	400.04	104.44		
185.8 163.83 172.23 154.62 151.69 1 Efficiency of water heater	135.78 130.6	143.03	142.68	160.32	169.24	181.41	70.0	(216)
	79.8 79.8	79.8	79.8	85.09	86.59	87.28	79.8	(217)
Fuel for water heating, kWh/month	79.0	79.0	7 9.0	03.03	00.59	07.20		(217)
(219) m = (64) m x $100 \div (217)$ m								
(219)m= 213.12 188.39 199.27 181.66 183.39 1	170.15 163.		178.8	188.42	195.45	207.85		_
		Tota	ıl = Sum(2	19a) ₁₁₂ =			2249.44	(219)
Annual totals				k\	Wh/year	r I	kWh/year	¬
Space heating fuel used, main system 1							2555.24	_
Water heating fuel used							2249.44	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boi <mark>ler with a fan-assisted flue</mark>						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							304.21	(232)
Total delivered energy for all uses (211)(221) +	(231) + (23	2)(237b)	=				5183.89	(338)
12a. CO2 emissions – Individual heating system	ns including	micro-CHF		_				
	Energy			Emice	ion fac	tor	Emissions	
	kWh/ye	ar		kg CO		toi	kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	551.93	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	485.88	(264)
Space and water heating	(261) + (26	52) + (263) +	(264) =				1037.81	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	157.88	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1234.62	(272)
						ı		_

TER =

(273)

18.62

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Flat Dwelling type:

Detachment:

2022 Year Completed:

Floor Location: Floor area:

> Storey height: 70 m² 3 m

Floor 0

26 m² (fraction 0.371) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:		Argon:	Fr	ame:
DOO	R	<u>Manuf</u> actur	er Solid				W	ood
W		Manufactur	er Windows	low-E, $En = 0.09$	5, soft coat	No		
N		Manufactur	er Windows	low-E, $En = 0.09$	5, soft coat	No		
Balco	ony	Manufactur	rer Windows	low-E, $En = 0.09$	5, soft coat	No		

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	2.72	1
N		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
N		N	North	0	0
Balcony		N	North	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen	<u>ts</u>						
N	29.4	8.96	20.44	0.15	0	False	N/A
W	29.4	2.72	26.68	0.15	0	False	N/A
INT	14.1	2.4	11.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
E	17.1	0	17.1	0.15	0	False	N/A
Roof	70	0	70	0.11	0		N/A
Internal Elemen	<u>ts</u>						

SAP Input

Party Elements

Thermal bridges:	
Thermal bridges:	No information on thermal bridging (y=0.15) (y =0.15)
Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 0 2 3
Main heating system:	
Main heating system:	Community heating schemes Heat source: Community boilers heat from boilers – mains gas, heat fraction 1, efficiency 95 Piping>=1991, pre-insulated, low temp, variable flow Central heating pump: 2013 or later Design flow temperature: Design flow temperature >45°C Boiler interlock: Yes
Main heating Control:	
Main heating Control:	Charging system linked to use of community heating, programmer and TRVs Control code: 2306
Secondary heating system:	
Secondary heating system: Water heating:	None
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Flue Gas Heat Recovery System: Database (rev 498, product index 060036) Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	Standard Tariff Yes No conservatory 100% Dense urban English No None

No

Assess Zero Carbon Home:

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty	Address	: Sample	e 8 (Top))			
Address:	:										
1. Overall dwelling dime	ensions:			۸۳۵	n/m²\		Av. Ho	ight(m)		Volume(m	3)
Ground floor				Ale	70	(1a) x		3	(2a) =	210	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)	+(1d)+(1e	e)+(1ı	n)	70	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	210	(5)
2. Ventilation rate:											_
Number of chimneys	main heating		econdar neating	ry □ + □	other 0	7 = [total	x	40 =	m³ per hou	ır
Number of open flues		-	0	┧╻┝	0	」	0	x	20 =	0	(6b)
Number of intermittent fa			0		0	┙╞			10 =		= `
						Ļ	0		10 =	0	(7a)
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges per h	our
Infiltration due to chimne	evs. flues and	fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has I						continue fr			. (0) –	O .	(0)
Number of storeys in t	he dw <mark>elling</mark> (ı	ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p						•	uction			0	(11)
deducting areas of openi			ponding to	ine great	er wall are	a (aner					
If suspended wooden	floor, enter 0.	2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	iter 0.05, else	enter 0								0	(13)
Percentage of window	s and doors	draught st	ripped							0	(14)
Window infiltration					•	2 x (14) ÷ 1	-	. (45)		0	(15)
Infiltration rate			.: 4				12) + (13) -			0	(16)
Air permeability value, If based on air permeabi				•	•	•	etre of e	envelope	area	3	=
Air permeability value applie	•						is beina u:	sed		0.15	(18)
Number of sides sheltere					, <i>p</i> .					2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fa	ctor			(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	for monthly w	ind speed	t								-
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Ta	ole 7								_	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m <i>≟ 1</i>										
VVIIId Factor (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	l	
(),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	~ 1 ''	1	I 5.55	I 5.55	1 5.52	l '	ı	I ''' ²	1	I	

0.16	0.16 0.16	0.14	0.14 0.12	0.12	0.12	(22a)m _{0.13}	0.14	0.14	0.15		
Calculate effec	ctive air change	1 1		1 -	0.12	0.13	0.14	0.14	0.15		
If mechanica	_									0.5	(2:
If exhaust air he	eat pump using App	oendix N, (23b)	= (23a) × Fmv (equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2:
If balanced with	heat recovery: effi	ciency in % allo	owing for in-use	factor (fron	n Table 4h) =				79.05	(2:
a) If balance	d mechanical v	entilation wi	th heat recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0.27	0.26 0.26	0.25	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
b) If balance	d mechanical v	entilation wi	thout heat re	covery (I	MV) (24b)m = (22	2b)m + (2	23b)		•	
24b)m= 0	0 0	0	0 0	0	0	0	0	0	0		(24
,	ouse extract ve $1 < 0.5 \times (23b)$,	•	•				5 × (23b)			
24c)m= 0	0 0	0	0 0	0	0	0	0	0	0		(2
,	ventilation or wl n = 1, then (24d		•				0.5]				
24d)m= 0	0 0	0	0 0	0	0	0	0	0	0		(2
Effective air	change rate - e	nter (24a) o	r (24b) or (24	c) or (24	d) in box	(25)					
25)m= 0.27	0.26 0.26	0.25	0.24 0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
3. Heat losses	s and heat loss	parameter:					•		_		
LEMENT	Gross area (m²)	Openings m ²	Net Ai A ,i		U-valı W/m2		A X U (W/k	()	k-value kJ/m²-ł		A X k kJ/K
)oo <mark>rs</mark>			2.4	x	1.4	= [3.36				(2
Vin <mark>dows</mark> Type	:1		2.72	. x	1/[1/(1)+	0.04] =	2.62				(2
Vindows Type	2		4.16	x	1/[1/(1)+	0.04] =	4				(2
Vindows Type	3		4.8	x	1/[1/(1)+	0.04] =	4.62				(2
Valls Type1	29.4	8.96	20.4	4 x	0.15	=	3.07	\exists			(2
Valls Type2	29.4	2.72	26.6	8 X	0.15	=	4				(2
								= =			
Valls Type3	14.1	2.4	11.7	, x	0.15	=	1.75				(2
• •	2.4		11.7	x x	0.15	= [1.75 0.84	_			==
Valls Type4		2.4	╡ ├──	X		=		_			(2
Valls Type3 Valls Type4 Valls Type5 Roof	2.4	0	2.4	X	0.35	=	0.84				(2
Valls Type4 Valls Type5	2.4 17.1 70	0 0	2.4	x x x	0.35	= [0.84 2.57				(2
Valls Type4 Valls Type5 Coof Otal area of el	2.4 17.1 70	2.4 0 0 0 effective windo	2.4 17.1 70 162. w U-value calcu	x x x x	0.35 0.15 0.11	= [= [= [0.84 2.57 7.7	s given in	paragraph	3.2	(2)
Valls Type4 Valls Type5 Coof Otal area of elfor windows and include the area	2.4 17.1 70 lements, m² roof windows, use	2.4 0 0 0 effective windo internal walls ar	2.4 17.1 70 162. w U-value calcu	x x x x	0.35 0.15 0.11	= [= [= [/[(1/U-valu	0.84 2.57 7.7	s given in	paragraph	34.52	(2 (2 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
Valls Type4 Valls Type5 Roof Total area of elfor windows and the area fabric heat los	2.4 17.1 70 Ilements, m² roof windows, use as on both sides of a	2.4 0 0 0 effective windo internal walls ar	2.4 17.1 70 162. w U-value calcu	x x x x	0.35 0.15 0.11	= [= [- = [0.84 2.57 7.7				(2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type4 Valls Type5 Roof Total area of elfor windows and * include the area Tabric heat los Heat capacity (2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A)	2.4 0 0 0 effective windo internal walls all x U)	2.4 17.1 70 162. w U-value calculated partitions	x x x 4	0.35 0.15 0.11	= [= [- = [0.84 2.57 7.7 (e)+0.04] as) + (32a).		34.52	(3)
Valls Type4 Valls Type5 Coof Cotal area of elector windows and a include the area abric heat los leat capacity (hermal mass or design assess	2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x Cm = S(A x k))	2.4 0 0 offective windo internal walls and U) IP = Cm ÷ TI details of the cortillation.	2.4 17.1 70 162.w U-value calcund partitions	x x x 4	0.35 0.15 0.11 0.11 0.11 0.11	= [= [- = [0.84 2.57 7.7 (e)+0.04] a (30) + (32)) + (32a). Medium	(32e) =	34.52 1726.48	(3)
Valls Type4 Valls Type5 Roof Total area of elfor windows and and an area include the area fabric heat los leat capacity (Thermal mass for design assess an be used instead	2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x k) parameter (TM) sments where the deserted as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the sec	2.4 0 0 offective windo internal walls all X U) IP = Cm ÷ TI letails of the conficulation.	2.4 17.1 70 162. w U-value calcund partitions FA) in kJ/m²k	x x x 4 lated using	0.35 0.15 0.11 0.11 0.11 0.11	= [= [- = [0.84 2.57 7.7 (e)+0.04] a (30) + (32)) + (32a). Medium	(32e) =	34.52 1726.48	(2)

Ventila	tion hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.52	18.3	18.08	16.98	16.76	15.65	15.65	15.43	16.09	16.76	17.2	17.64		(38)
Heat tra	ansfer c	oefficier	nt, W/K	-				-	(39)m	= (37) + (3	38)m			
(39)m=	77.4	77.18	76.96	75.85	75.63	74.53	74.53	74.31	74.97	75.63	76.07	76.52		
Heat lo	ss para	meter (F	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	75.8	(39)
(40)m=	1.11	1.1	1.1	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.09	1.09		
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.08	(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)
Assum	ed occu A > 13.9	pancy, l 9, N = 1			(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (1	ΓFA -13.		kWh/ye	ear:	(42)
Annual		e hot wa						(25 x N) to achieve		e target o		7.55		(43)
			person per			_	•	o acmeve	a water us	e larger o	'			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						ООР		1101			
(44)m=	96.3	92.8	89.3	85.79	82.29	78.79	78.79	82.29	85.79	89.3	92.8	96.3		
Energy c	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1050.55	(44)
(45)m=	142.81	124.9	128.89	112.37	107.82	93.04	86.22	98.93	100.12	116.67	127.36	138.3		
If instant	aneous w	ater heatii	na at noint	of use (no	hot water	storage)	enter () in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1377.43	(45)
г			· ,	,				` ′	. ,	17.5	10.1	20.75		(46)
(46)m= Water s	21.42 storage	18.74 loss:	19.33	16.86	16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.75	ı	(40)
	_		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Otherw	•	stored	nd no ta hot wate		•			(47) ombi boil	ers) ente	er 'O' in (47)			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage eclared o			or io not		(48) x (49)	=		1	10		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl							0.	.02		(51)
	-	eaung s from Tal	ee section ble 2a	011 4.3							1	.03		(52)
			m Table	2b								0.6		(53)
•			storage		ear			(47) x (51)	x (52) x (53) =		.03		(54)
□Heruv			_	, ,					. , (•			1	(55)
• • • • • • • • • • • • • • • • • • • •	(50) or (54) in (5	5)								1.	.03	l	(33)
Enter (, ,	o5) culated f	for each	month			((56)m = (55) × (41)r	m	1.	.03		(55)

If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	: loss (ar	nual) fro	m Table	3	•	•					0		(58)
Primary circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				'	
(modified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	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) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat req	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 198.09	174.83	184.17	165.86	163.1	146.53	141.49	154.21	153.61	171.95	180.85	193.58		(62)
Solar DHW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (G)				<u>-</u>	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 18.35	16.34	16.79	14.86	14.3	12.43	11.52	13.19	13.34	15.37	16.62	17.85		(63) (G2)
Output from w	ater hea	ter											
(64)m= 177.06	156.07	164.69	148.41	146.11	131.51	127.29	138.34	137.67	153.9	161.64	173.05		_
							Outp	out from wa	ater heate	r (annual)₁	12	1815.73	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2		× (45)m	+ (61)n	1] + 0.8 >	۲ [(4 <mark>6)m</mark>	+ (57)m	+ (59)m	1	
(65)m= 91.71	81.47	87.08	80.16	80.07	73.73	72.89	77.12	76.08	83.02	85.14	90.21		(65)
												1	
in <mark>clude</mark> (57)	m in calc	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	<mark>mu</mark> nity h	eating	
include (57) 5. Internal ga			` ′		ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	neating	
	ains (see	Table 5	and 5a		ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Internal ga	ains (see	Table 5	and 5a		ylinder is Jun	s in the o	dwelling Aug	Sep	ater is fr	om com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):								neating	(66)
5. Internal ga Metabolic gair Jan	real section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section) in the section (section	Table 5 5), Wat Mar 112.31 ted in Ap	ts Apr 112.31	May 112.31	Jun 112.31	Jul 112.31	Aug 112.31	Sep 112.31	Oct 112.31	Nov	Dec 112.31	neating	(66)
5. Internal ga Metabolic gair Jan (66)m= 112.31	res (Table Feb 112.31	Table 5 5), Wat Mar 112.31	and 5a) ts Apr 112.31	May 112.31	Jun 112.31	Jul 112.31	Aug 112.31	Sep 112.31	Oct	Nov	Dec	neating	(66) (67)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga	res (Table Feb 112.31 (calcula 16.61 ins (calcula	Table 5 5), Wat Mar 112.31 ted in Ap 13.51	Apr 112.31 ppendix 10.23	May 112.31 L, equat 7.64 dix L, eq	Jun 112.31 ion L9 o 6.45 uation L	Jul 112.31 r L9a), a 6.97 13 or L1	Aug 112.31 Iso see 9.06 3a), also	Sep 112.31 Table 5 12.17 see Ta	Oct 112.31	Nov 112.31	Dec 112.31	neating	(67)
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains (67)m= 18.7	reins (see ns (Table Feb 112.31 (calcula 16.61	Table 5 5), Wat Mar 112.31 ted in Ap	ts Apr 112.31 Appendix 10.23	May 112.31 L, equat	Jun 112.31 ion L9 o	Jul 112.31 r L9a), a 6.97	Aug 112.31 Iso see	Sep 112.31 Table 5	Oct 112.31	Nov 112.31	Dec 112.31	neating	, ,
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances games (68)m= 197.3 Cooking gains	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34	Mar 112.31 ted in Ap 13.51 ulated in 194.19	Apr 112.31 ppendix 10.23 Appendix 183.2	May 112.31 L, equat 7.64 dix L, eq	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a	Aug 112.31 Iso see 9.06 3a), also	Sep 112.31 Table 5 12.17 see Ta 150.71	Oct 112.31 15.45 ble 5 161.7	Nov 112.31	Dec 112.31	neating	(67) (68)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34	Table 5 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19	Apr 112.31 ppendix 10.23 Appendix 183.2	May 112.31 L, equat 7.64 dix L, eq	Jun 112.31 ion L9 o 6.45 uation L 156.31	Jul 112.31 r L9a), a 6.97 13 or L1 147.6	Aug 112.31 Iso see 9.06 3a), also	Sep 112.31 Table 5 12.17 see Ta 150.71	Oct 112.31 15.45 ble 5 161.7	Nov 112.31	Dec 112.31	neating	(67)
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in A	Apr 112.31 ppendix 10.23 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a	Aug 112.31 Iso see 9.06 3a), also 145.55	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table	Oct 112.31 15.45 ble 5 161.7	Nov 112.31 18.03	Dec 112.31 19.22 188.59	neating	(67) (68)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in A	Apr 112.31 ppendix 10.23 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a	Aug 112.31 Iso see 9.06 3a), also 145.55	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table	Oct 112.31 15.45 ble 5 161.7	Nov 112.31 18.03	Dec 112.31 19.22 188.59	neating	(67) (68)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and fair	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23 ins gains 0	112.31 ted in Ap 13.51 ulated in 194.19 ated in A 34.23 (Table 5	112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 see Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23 ins gains 0	112.31 ted in Ap 13.51 ulated in 194.19 ated in A 34.23 (Table 5	112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 see Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0 Losses e.g. ev	raporatio	Table 5 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ted in Ap 34.23 (Table 5 0 on (negatine)	Apr 112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a) 0	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56 34.23	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69) (70)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and fai (70)m= 0 Losses e.g. ev (71)m= -89.84	raporatio	Table 5 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ted in Ap 34.23 (Table 5 0 on (negatine)	Apr 112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a) 0	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56 34.23	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69) (70)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -89.84 Water heating	res (Table Feb 112.31 (calcular 16.61 ins (calcular 34.23 ins gains 0 vaporation 89.84 gains (Table 121.24	Table 5 9 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in Ap 34.23 (Table 5 0 on (negation of the context) -89.84 Table 5)	Apr 112.31 opendix 10.23 n Append 183.2 opendix 34.23 5a) 0 tive valu	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23 0 es) (Tab	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23 0 ole 5) -89.84	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55), also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23 0	Oct 112.31 15.45 ble 5 161.7 5 34.23 0 -89.84	Nov 112.31 18.03 175.56 34.23 0	Dec 112.31 19.22 188.59 34.23 0	neating	(67) (68) (69) (70) (71)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -89.84 Water heating (72)m= 123.26	res (Table Feb 112.31 (calcular 16.61 ins (calcular 34.23 ins gains 0 vaporation 89.84 gains (Table 121.24	Table 5 9 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in Ap 34.23 (Table 5 0 on (negation of the context) -89.84 Table 5)	Apr 112.31 opendix 10.23 n Append 183.2 opendix 34.23 5a) 0 tive valu	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23 0 es) (Tab	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23 0 ole 5) -89.84	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23 0	Oct 112.31 15.45 ble 5 161.7 5 34.23 0 -89.84	Nov 112.31 18.03 175.56 34.23 0	Dec 112.31 19.22 188.59 34.23 0	neating	(67) (68) (69) (70) (71)

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

Orienta		Access Facto Table 6d	or	Area m²		Flu Ta	x ble 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	×	4.16	,	1	0.63	x	0.4	x	0.7	=	8.58	(74)
North	0.9x	0.77	×	4.8	= ,		0.63	x	0.4	x	0.7	<u> </u>	9.9	(74)
North	0.9x	0.77	X	4.16	<u> </u>		20.32	x	0.4	x	0.7	_ =	16.4	(74)
North	0.9x	0.77	x	4.8	= ,	: 2	20.32	x	0.4	x	0.7	<u> </u>	18.93	(74)
North	0.9x	0.77	×	4.16	<u> </u>		34.53	x	0.4	x	0.7	_ =	27.87	(74)
North	0.9x	0.77	X	4.8	<u> </u>	: [;	34.53	x	0.4	x	0.7	=	32.16	(74)
North	0.9x	0.77	x	4.16	<u> </u>		55.46	x	0.4	X	0.7	=	44.77	(74)
North	0.9x	0.77	X	4.8	<u> </u>		55.46	x	0.4	X	0.7	=	51.66	(74)
North	0.9x	0.77	X	4.16	<u> </u>	: -	4.72	x	0.4	x	0.7	=	60.31	(74)
North	0.9x	0.77	X	4.8	,	7	4.72	x	0.4	X	0.7	=	69.59	(74)
North	0.9x	0.77	X	4.16	<u> </u>	7	'9.99	x	0.4	x	0.7	=	64.56	(74)
North	0.9x	0.77	X	4.8	<u> </u>	: 7	'9.99	x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	x	4.16	,	- 7	4.68	x	0.4	X	0.7	=	60.28	(74)
North	0.9x	0.77	X	4.8	<u> </u>	- -	4.68	x	0.4	X	0.7	=	69.55	(74)
North	0.9x	0.77	x	4.16	<u> </u>		9.25	x	0.4	X	0.7	=	47.82	(74)
North	0.9x	0.77	X	4.8			9.25	Х	0.4	X	0.7		55.18	(74)
North	0.9x	0.77	x	4.16	<u> </u>		1.52	х	0.4	x	0.7		33.51	(74)
North	0.9x	0.77	x	4.8		. 4	1.52] x	0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	x	4.16	,	2	24.19	x	0.4	x	0.7	=	19.53	(74)
North	0.9x	0.77	x	4.8	,	2	24.19	Х	0.4	х	0.7	=	22.53	(74)
North	0.9x	0.77	x	4.16	7		3.12	х	0.4	x	0.7	=	10.59	(74)
North	0.9x	0.77	x	4.8	,		3.12	х	0.4	x	0.7	=	12.22	(74)
North	0.9x	0.77	x	4.16			8.86	x	0.4	х	0.7	=	7.16	(74)
North	0.9x	0.77	X	4.8)		8.86	x	0.4	x	0.7	=	8.26	(74)
West	0.9x	0.77	X	2.72)	1	9.64	X	0.4	X	0.7	=	10.37	(80)
West	0.9x	0.77	X	2.72)	: [3	88.42	x	0.4	X	0.7	=	20.28	(80)
West	0.9x	0.77	X	2.72	,	. (3.27	x	0.4	x	0.7	=	33.39	(80)
West	0.9x	0.77	X	2.72)		2.28	x	0.4	X	0.7	=	48.7	(80)
West	0.9x	0.77	X	2.72	,	1	13.09	X	0.4	X	0.7	=	59.69	(80)
West	0.9x	0.77	X	2.72)	1	15.77	x	0.4	X	0.7	=	61.1	(80)
West	0.9x	0.77	X	2.72	,	1	10.22	X	0.4	X	0.7	=	58.17	(80)
West	0.9x	0.77	X	2.72	,		94.68	x	0.4	X	0.7	=	49.97	(80)
West	0.9x	0.77	X	2.72)	7	'3.59	X	0.4	X	0.7	=	38.84	(80)
West	0.9x	0.77	X	2.72)	. 4	5.59	x	0.4	X	0.7	=	24.06	(80)
West	0.9x	0.77	X	2.72)	2	24.49	x	0.4	x	0.7	=	12.93	(80)
West	0.9x	0.77	X	2.72)		6.15	x	0.4	x	0.7	=	8.52	(80)
ו		watts, calcul	$\overline{}$		$\overline{}$		1		n = Sum(74)m.				7	
(83)m=	28.85		.43		9.59	200.16	188	152	.97 111.02	66.12	35.73	23.94]	(83)
Ī		internal and		<u>` </u>	_	• •	r	1.55	04 405 55	444.5	104.55	400.55	1	(0.4)
(84)m=	424.8	449.49 474	1.85	506.58 530	0.89	522.02	497.24	467	.94 436.26	411.53	3 404.27	409.69	J	(84)

7. Me	an inter	nal temp	perature	(heating	season)								
							from Tah	ole 9, Th	1 (°C)				21	(85)
-		_		living are		_		JIO 0, 111	. (0)				21	(00)
Otilise	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.98	0.93	0.8	0.63	0.69	0.9	0.98	1	1		(86)
			l	<u> </u>						0.50	'	'		(00)
			1					in Table			1		1	(O-)
(87)m=	19.83	19.92	20.13	20.43	20.72	20.92	20.98	20.97	20.83	20.48	20.11	19.81		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, Ti	h2 (°C)					
=m(88)	20	20	20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.97	0.9	0.72	0.51	0.56	0.85	0.98	0.99	1		(89)
Mean	interna	l tampar	ature in	the rest	of dwelli	na T2 (f	ollow etc	eps 3 to 7	7 in Tahl				l	
(90)m=	18.43	18.58	18.87	19.32	19.72	19.97	20.02	20.02	19.88	19.4	18.86	18.42		(90)
(00)		.0.00		10.02							g area ÷ (4		0.37	(91)
											`	<i>'</i>	0.01	(- 1)
			· `					+ (1 – fL			1	1	 	(00)
(92)m=	18.95	19.08	19.34	19.73	20.09	20.32	20.38	20.37	20.23	19.8	19.32	18.93		(92)
	_							4e, whe						(00)
(93)m=	18.95	19.08	19.34	19.73	20.09	20.32	20.38	20.37	20.23	19.8	19.32	18.93		(93)
		ting requ				1 1 1		-	-11	. —	-0)			
				mperatui using Ta		ed at ste	ep 11 of	l able 9	o, so tha	t II,m=(/6)m an	d re-calc	ulate	
tric at	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		ividy	Juli	- Cal	, rug	ООР	001	1101	200		
(94)m=	1	0.99	0.99	0.97	0.91	0.75	0.55	0.61	0.86	0.97	0.99	1		(94)
	L gains.	hmGm	<u> </u>	4)m x (84	4)m									
(95)m=	423.17	446.89	469.38	490.63	480.76	389.94	275.64	285.54	376.52	400.66	401.39	408.38		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8	<u> </u>	l			<u> </u>	l		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	<u>I</u>			
(97)m=	1133.7	1094.16	988.1	821.43	634.54	426.61	281.65	295.3	459.75	695.89	929.91	1127.45		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m		l	
(98)m=	528.64	434.97	385.93	238.18	114.42	0	0	0	0	219.65	380.53	534.99		
!			•	•				Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2837.3	(98)
Space	e heatin	a require	ement in	kWh/m²	?/vear								40.53	(99)
•		•											10.00	
				mmunity	Ĭ			·	المالة والما					
						-		ting prov (Table 1	-		unity scr	neme.	0	(301)
	•			•		•	_	(10.010	., •	00				╡`
	•			mmunity	•	,	,						1	(302)
	-	-						allows for See Appei		up to four	other heat	sources; ti	he latter	
			-	ity boiler		on power	งเสมปกิ	oce Appel	IUIA U.				1	(303a)
				,									-	` ′

Fraction of total space heat from Community boile	ers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c			1] (305)
Distribution loss factor (Table 12c) for community			1.05	<u> </u> (306)
Space heating	0 ,		kWh/year	」
Annual space heating requirement			2837.3	
Space heat from Community boilers	(98) x (3	304a) x (305) x (306) =	2979.17	(307a)
Efficiency of secondary/supplementary heating sy	stem in % (from Table 4a or /	Appendix E)	0	(308
Space heating requirement from secondary/suppl	ementary system (98) x (3	301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1815.73	7
If DHW from community scheme: Water heat from Community boilers	(64) x (3	303a) x (305) x (306) =	1906.52] (310a)
Electricity used for heat distribution	0.01 × [(307a	u)(307e) + (310a)(310e)] =	48.86	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, i	If not enter 0) $= (107)$	÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Tal mechanical ventilation - balanced, extract or position)			124.9	(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) =	124.9	(331)
Energy for lighting (calculated in Appendix L)			330.25	(332)
Total delivered energy for all uses (307) + (309) +	- (310) + (312) + (315) + (331)) + (<mark>332)</mark> .(237b) =	5340.83	(338)
12b. CO2 Emissions – Community heating schem	ne			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heati	•	g ••=	g	
	there is CHP using two fuels repeat (363) to (366) for the second fue	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (36	(7b) x 0.22	1110.85	(367)
Electrical energy for heat distribution	[(313) x	0.52	25.36	(372)
Total CO2 associated with community systems	(363)(366) + (368	8)(372)	1136.21	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heate	r or instantaneous heater (3	12) x 0.22	0	(375)
Total CO2 associated with space and water heati	ng (373) + (374) + (37	(5) =	1136.21	(376)
CO2 associated with electricity for pumps and far	ns within dwelling (331)) x	0.52	64.82	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	171.4	(379)
Total CO2, kg/year sum of (37	6)(382) =		1372.43	(383)
Dwelling CO2 Emission Rate (383) ÷ (4)	=		19.61	(384)
El rating (section 14)			84.01	(385)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	;	Stroma Softwa	re Ve	rsion:	\	Versio	on: 1.0.5.51	
Address :	·	Property A	Address.	Sample	e o (10p))			
1. Overall dwelling dimer	nsions:								
0 1"		Area			Av. He	ight(m)	7	Volume(m	<u> </u>
Ground floor			70	(1a) x		3	(2a) =	210	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1i	n)	70	(4)					
Dwelling volume				(3a)+(3b))+(3c)+(3d	d)+(3e)+	(3n) =	210	(5)
2. Ventilation rate:									
	main secondar heating heating	ry (other		total			m³ per hou	ır
Number of chimneys	0 + 0] + [0] = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fan	ns			·	2	x	10 =	20	(7a)
Number of passive vents					0	х	10 =	0	(7b)
Number of flueless gas fire	es			<u> </u>	0	X ·	40 =	0	(7c)
		70) ((7b) ((7						nanges per ho	our
	s, flues and fans = (6a)+(6b)+(7 en carried out or is intended, procee			ontinue fr	20 com (9) to (÷ (5) =	0.1	(8)
Number of storeys in the					(2) 22 (, ,		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame of			•	uction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding to gs): if equal user 0.35	o the greate	er wall area	a (after					
If suspended wooden flo	oor, enter 0.2 (unsealed) or 0	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0							0	(13)
-	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	,	-	(45)		0	(15)
Infiltration rate					12) + (13) -			0	(16)
•	q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre	-	•	•	etre of e	envelope	area	5	(17)
·	if a pressurisation test has been do				is being us	sed		0.35	(18)
Number of sides sheltered		J	,	,	J			2	(19)
01 14 6 4		((20) = 1 - [0.075 x (1	19)] =			0.85	(20)
Shelter factor									
Shelter factor Infiltration rate incorporation	ng shelter factor	((21) = (18)	x (20) =				0.29	(21)
Infiltration rate incorporation	r monthly wind speed					1	1	0.29	(21)
Infiltration rate incorporation rate modified fo	-	Jul	(21) = (18) Aug	x (20) =	Oct	Nov	Dec	0.29	(21)
Infiltration rate incorporation Infiltration rate modified fo Jan Feb Monthly average wind spe	Mar Apr May Juneed from Table 7	Jul	Aug	Sep		1		0.29	(21)
Infiltration rate incorporation Infiltration rate modified fo Jan Feb Monthly average wind spe	or monthly wind speed Mar Apr May Jun				Oct 4.3	Nov 4.5	Dec 4.7	0.29	(21)
Infiltration rate incorporation Infiltration rate modified fo Jan Feb Monthly average wind spe	Mar Apr May Jun eed from Table 7 4.9 4.4 4.3 3.8	Jul	Aug	Sep		1		0.29	(21)

0.37	0.37 0.36	0.32	0.32	0.28	0.28	0.27	(22a)m _{0.29}	0.32	0.33	0.34	1	
Calculate effec	ctive air change	1		1 ' '	I	J	0.20	0.02	0.00	1 0.0 .	J	
If mechanica	al ventilation:										0	(2
	eat pump using App) = (23a)			0	(2
If balanced with	heat recovery: eff	iciency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	d mechanical v	entilation/	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
!4a)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(2
· —	d mechanical v	entilation		1	covery (N	MV) (24b	i `		 		7	
4b)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(2
,	ouse extract ven $< 0.5 \times (23b)$,		•	•				5 × (23b	o)		_	
4c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(2
,	ventilation or w n = 1, then (24c			•				0.5]				
4d)m= 0.57	0.57 0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56]	(2
Effective air	change rate - e	enter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
5)m= 0.57	0.57 0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		()
B. Heat losse	s and heat loss	paramete	er:							_	_	
LEMENT	Gross area (m²)	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
oors				2.4	х	1	= [2.4				(
/in <mark>dows</mark> Type	: 1			2.72	x1	/[1/(1.4)+	0.04] =	3.61	П			(:
/indows Type	2											
lin dans True				4.16		/[1/(1.4)+	1	5.52	Ę			· ·
• •			_	4.16		/[1/(1.4)+ /[1/(1.4)+	1	5.52 6.36			_ 	(
/alls Type1	29.4	8.96	=	4.8	x1	/[1/(1.4)+ 0.18	1	6.36				()
/alls Type1 /alls Type2	3	8.96	=	4.8	x1	/[1/(1.4)+	0.04] =	6.36				()
/indows Type /alls Type1 /alls Type2 /alls Type3	29.4		=	4.8	x1 4 x 3 x	/[1/(1.4)+ 0.18	0.04] =	6.36				(:
/alls Type1 /alls Type2 /alls Type3 /alls Type4	29.4	2.72	=	20.44 26.68	x1 4 x 3 x	/[1/(1.4)+ 0.18 0.18	0.04] = [6.36 3.68 4.8				
/alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5	29.4 29.4 14.1	2.72	=	20.44 26.68 11.7	x1 4	0.18 0.18 0.18	0.04] = [6.36 3.68 4.8 2.11				(0)
/alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof	29.4 29.4 14.1 2.4 17.1	2.72	=	4.8 20.44 26.68 11.7 2.4	x1 4	0.18 0.18 0.18 0.18	0.04] = = = = =	6.36 3.68 4.8 2.11 0.43				
/alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof otal area of e	29.4 29.4 14.1 2.4 17.1 70 Ilements, m ²	2.72 2.4 0 0		4.8 20.44 26.68 11.7 2.4 17.1 70	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = =	6.36 3.68 4.8 2.11 0.43 3.08 9.1				(3)
Valls Type1 Valls Type2 Valls Type3 Valls Type4 Valls Type5 Coof Cotal area of e	29.4 29.4 14.1 2.4 17.1 70 Rements, m ²	2.72 2.4 0 0 0 effective wi	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = =	6.36 3.68 4.8 2.11 0.43 3.08 9.1	as given in	paragrapl	h 3.2	
alls Type1 alls Type2 alls Type3 alls Type4 alls Type5 oof otal area of e or windows and include the area	29.4 29.4 14.1 2.4 17.1 70 Ilements, m ²	2.72 2.4 0 0 0 effective wii	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = [6.36 3.68 4.8 2.11 0.43 3.08 9.1] [paragrapl	h 3.2	
alls Type1 alls Type2 alls Type3 alls Type4 alls Type5 oof otal area of e or windows and include the area abric heat los	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of	2.72 2.4 0 0 0 effective wii	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = = /[(1/U-value) + (32) =	6.36 3.68 4.8 2.11 0.43 3.08 9.1				
Valls Type1 Valls Type2 Valls Type3 Valls Type4 Valls Type5 Oof Otal area of each of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the area of the a	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of es, W/K = S (A x)	2.72 2.4 0 0 0 v effective wiinternal walk	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calculatitions	x1 4 x 3 x x x x 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = = (1/U-value) + (32) =	6.36 3.68 4.8 2.11 0.43 3.08 9.1	2) + (32a).		41.0	() () () () () () () () () () () () () (
falls Type1 falls Type2 falls Type3 falls Type4 falls Type5 foof fotal area of earth of the area fabric heat lose eat capacity for the area for design assess	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x k)	2.72 2.4 0 0 0 effective will internal walk x U) MP = Cm :	ndow U-vals and par	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcultitions	x1 4 x 3 x x x x x 4 x x a 4 a x a x a x	0.18 0.18 0.18 0.18 0.18 0.18 0.13 0.13 (26)(30)	0.04] = = = = = = /[(1/U-value) + (32) = ((28)	6.36 3.68 4.8 2.11 0.43 3.08 9.1 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.0 1726	() () () () () () () () () () () () () (
Valls Type1 Valls Type2 Valls Type3 Valls Type4 Valls Type5 Oof Otal area of each of the area abric heat lose eat capacity of the area of the area of the area abric heat lose eat capacity of the area or design assess or design assess or design assess or be used instead	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x k) parameter (TM sments where the of as the same transments where the of as the same transments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the of a sments where the other than the sments where the of a sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the other than the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments where the sments	2.72 2.4 0 0 0 effective windering internal walks x U) MP = Cm - details of the local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local loc	ndow U-vals and par	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul titions	x1 4 x 3 x x x x x 4 lated using	0.18 0.18 0.18 0.18 0.18 0.18 0.13 0.13 (26)(30)	0.04] = = = = = = /[(1/U-value) + (32) = ((28)	6.36 3.68 4.8 2.11 0.43 3.08 9.1 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.0 1726	08 (0

Ventilat	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	39.5	39.31	39.13	38.26	38.1	37.34	37.34	37.2	37.63	38.1	38.43	38.77		(38)
Heat tra	ansfer c	oefficier	nt, W/K	-		-	-		(39)m	= (37) + (38)m	-		
(39)m=	88.7	88.51	88.33	87.46	87.3	86.55	86.55	86.41	86.84	87.3	87.63	87.97		
- Heat lo	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	87.46	(39)
(40)m=	1.27	1.26	1.26	1.25	1.25	1.24	1.24	1.23	1.24	1.25	1.25	1.26		
Numbe	er of day	s in moi	nth (Tab	le 1a)						Average =	Sum(40) ₁ .	12 /12=	1.25	(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. Wat	ter heat	ing ene	rgy requi	irement:								kWh/ye	ar:	
Δeeum	ed occu	ipancy, I	N									25		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		25		(42)
								(25 x N)			87	.55		(43)
				usage by : [·] day (all w				to achieve	a water us	se target o	f			
Г	Jan	Feb	Mar		Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Hot wate				Apr ach month					Sep	Oct	NOV	Dec		
(44)m=	96.3	92.8	89.3	85.79	82.29	78.79	78.79	82.29	85.79	89.3	92.8	96.3		
(32.0									m(44) ₁₁₂ =		1050.55	(44)
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	142.81	124.9	128.89	112.37	107.82	93.04	86.22	98.93	100.12	116.67	127.36	138.3		
If inetants	aneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	_ [1377.43	(45)
г		18.74		16.86		· · ·		, ,	. , ,	47.5	10.1	20.75		(46)
(46)m= [Water s	21.42 storage		19.33	10.00	16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.75		(40)
	_		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
If comn	nunity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage			(- /1.14/1	(d.)							
•				oss facto	or is kno	wn (kvvr	n/day):					39		(48)
•			m Table					()				54		(49)
			_	, kWh/ye cylinder l		or is not		(48) x (49)) =		0.	75		(50)
•				om Tabl								0		(51)
			ee secti											
		from Ta										0		(52)
•			m Table									0		(53)
• • • • • • • • • • • • • • • • • • • •			-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
•	` ′ ′	(54) in (5	•	ا سما	ma n := 41:			//E0\===	FF) ///	_	0.	75		(55)
Water s _{(56)m=} [for each			·	((56)m = (
	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56

If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (an	nual) fro	m Table	3		-			-		0		(58)
Primary circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	55 × (41)	m				,	
(modified by							_		—			1	
(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	İ	(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	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 189.41	166.99	175.48	157.46	154.41	138.13	132.81	145.53	145.21	163.27	172.45	184.9		(62)
Solar DHW input of	alculated	using App	endix G or	· Appendix	H (negati	ve quantity	v) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix ()	ī	ī		1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	j	(63)
FHRS 0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output from wa	ater hea	ter										,	
(64)m= 189.41	166.99	175.48	157.46	154.41	138.13	132.81	145.53	145.21	163.27	172.45	184.9		7
										r (annual)₁		1926.05	(64)
Heat gains from	n water	_	kWh/mo	onth 0.2	5 ^[0.85	× (45)m	+ (61)m] + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	
(65)m= 84.76	75.2	80.13	73.44	73.13	<mark>6</mark> 7.01	65.94	70.17	69.36	76.07	78.42	83.26		(65)
												•	
in <mark>clude</mark> (57)r	m in calc	culation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	<mark>mu</mark> nity h	neating	
include (57)r 5. Internal ga			` '		ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
	nins (see	Table 5	and 5a)		ylinder is	s in the			ater is fr	om com	<mark>mu</mark> nity h	neating	
5. Internal ga	ins (see s (Table Feb	Table 5 5), Wat Mar	and 5a) ts Apr	: May	Jun	Jul	Aug	Sep	Oct	Nov	munity h	neating	
5. Internal ga	ins (see s (Table	Table 5	and 5a):								neating	(66)
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains	s (Table Feb 112.31 (calcular	Table 5 5), Wat Mar 112.31 ted in Ap	ts Apr 112.31	May 112.31	Jun 112.31 ion L9 oi	Jul 112.31	Aug 112.31 Iso see	Sep 112.31	Oct	Nov	Dec	neating	
5. Internal ga Metabolic gain Jan (66)m= 112.31	s (Table Feb 112.31	5), Wat Mar 112.31	and 5a) ts Apr 112.31	May 112.31	Jun 112.31	Jul 112.31	Aug 112.31	Sep 112.31	Oct	Nov	Dec	neating	(66) (67)
5. Internal ga Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai	s (Table Feb 112.31 (calcula 16.17 ns (calc	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in	Apr 112.31 ppendix 9.95	May 112.31 L, equat 7.44 dix L, eq	Jun 112.31 ion L9 or 6.28 uation L	Jul 112.31 r L9a), a 6.79 13 or L1	Aug 112.31 Iso see 8.82 3a), also	Sep 112.31 Table 5 11.84 see Tal	Oct 112.31 15.04 ble 5	Nov 112.31 17.55	Dec 112.31	neating	(67)
5. Internal games Metabolic gains Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3	s (Table Feb 112.31 (calcula 16.17 ns (calc	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19	Apr 112.31 ppendix 9.95 Appendix 183.2	May 112.31 L, equat 7.44 dix L, eq	Jun 112.31 ion L9 or 6.28 uation L	Jul 112.31 r L9a), a 6.79 13 or L1 147.6	Aug 112.31 Iso see - 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Ta 150.71	Oct 112.31 15.04 ble 5 161.7	Nov 112.31	Dec 112.31	neating	
5. Internal games Jan	s (Table Feb 112.31 (calcula 16.17 ns (calcula 199.34 (calcula	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19	Apr 112.31 opendix 9.95 Append 183.2 opendix	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a	Aug 112.31 Iso see - 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Ta 150.71	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31	neating	(67) (68)
5. Internal games Metabolic gains Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3	s (Table Feb 112.31 (calcula 16.17 ns (calc	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in	Apr 112.31 ppendix 9.95 Appendix 183.2	May 112.31 L, equat 7.44 dix L, eq	Jun 112.31 ion L9 or 6.28 uation L	Jul 112.31 r L9a), a 6.79 13 or L1 147.6	Aug 112.31 Iso see - 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Ta 150.71	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31	neating	(67)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23	Apr 112.31 ppendix 9.95 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a	Aug 112.31 Iso see 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31 18.71 188.59	neating	(67) (68) (69)
Metabolic gains [66]m= 112.31 Lighting gains [67]m= 18.2 Appliances gai [68]m= 197.3 Cooking gains [69]m= 34.23	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23	Apr 112.31 ppendix 9.95 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a	Aug 112.31 Iso see 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31 18.71 188.59	neating	(67) (68)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23 ns gains	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see - 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23 ns gains	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see - 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69)
Metabolic gains Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3 Losses e.g. even	s (Table Feb 112.31 (calcula 16.17 ns (calcula 34.23 ns gains 3 aporatio -89.84	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 on (negative)	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69) (70) (71)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3 Losses e.g. ev. (71)m= -89.84	s (Table Feb 112.31 (calcula 16.17 ns (calcula 34.23 ns gains 3 aporatio -89.84	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 on (negative)	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69) (70)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3 Losses e.g. ev. (71)m= -89.84 Water heating	s (Table Feb 112.31 (calcular 16.17 ns (calcular 199.34 (calcular 34.23 ns gains 3 aporatio -89.84 gains (Table 111.9	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 In (negation 198.84) Table 5) 107.7	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3 tive valu	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.28 uation L 156.31 tion L15 34.23 3 ole 5) -89.84	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23 3	Oct 112.31 15.04 ble 5 161.7 5 34.23 3 -89.84	Nov 112.31 17.55 175.56 34.23 3	Dec 112.31 18.71 188.59 34.23 3 -89.84	neating	(67) (68) (69) (70) (71)
Metabolic gains [66]m= 112.31 Lighting gains [67]m= 18.2 Appliances gai [68]m= 197.3 Cooking gains [69]m= 34.23 Pumps and far [70]m= 3 Losses e.g. ev [71]m= -89.84 Water heating [72]m= 113.93	s (Table Feb 112.31 (calcular 16.17 ns (calcular 199.34 (calcular 34.23 ns gains 3 aporatio -89.84 gains (T 111.9 gains = 387.11	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 In (negation 198.84) Table 5) 107.7	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3 tive valu	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.28 uation L 156.31 tion L15 34.23 3 ole 5) -89.84	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23 3	Oct 112.31 15.04 ble 5 161.7 5 34.23 3 -89.84	Nov 112.31 17.55 175.56 34.23 3	Dec 112.31 18.71 188.59 34.23 3 -89.84	neating	(67) (68) (69) (70) (71)

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

Orientation:	Access Fac Table 6d	tor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	X	4.16	x	10.63	x	0.63	x	0.7	=	13.52	(74)
North 0.9	x 0.77	x	4.8	X	10.63	x	0.63	x	0.7	=	15.6	(74)
North 0.9	x 0.77	X	4.16	X	20.32	x	0.63	x	0.7	=	25.84	(74)
North 0.9	x 0.77	x	4.8	x	20.32	x	0.63	x	0.7	=	29.81	(74)
North 0.9	x 0.77	X	4.16	X	34.53	X	0.63	x	0.7	=	43.9	(74)
North 0.9	x 0.77	X	4.8	X	34.53	X	0.63	x	0.7	=	50.65	(74)
North 0.9	x 0.77	X	4.16	X	55.46	X	0.63	x	0.7		70.51	(74)
North 0.9	x 0.77	X	4.8	X	55.46	X	0.63	x	0.7	=	81.36	(74)
North 0.9	x 0.77	x	4.16	X	74.72	x	0.63	x	0.7	=	94.99	(74)
North 0.9	x 0.77	x	4.8	X	74.72	x	0.63	x	0.7	=	109.6	(74)
North 0.9	x 0.77	x	4.16	X	79.99	x	0.63	x	0.7	=	101.69	(74)
North 0.9	x 0.77	x	4.8	x	79.99	X	0.63	х	0.7	=	117.33	(74)
North 0.9	x 0.77	x	4.16	X	74.68	X	0.63	х	0.7	=	94.94	(74)
North 0.9	x 0.77	x	4.8	X	74.68	x	0.63	x	0.7	=	109.55	(74)
North 0.9	x 0.77	x	4.16	x	59.25	x	0.63	x	0.7	=	75.32	(74)
North 0.9	x 0.77	x	4.8	X	59.25	Х	0.63	Х	0.7	=	86.91	(74)
North 0.9	x 0.77	x	4.16	x	41.52	х	0.63	х	0.7		52.78	(74)
North 0.9	x 0.77	×	4.8	х	41.52		0.63	x	0.7		60.9	(74)
North 0.9	x 0.77	×	4.16	x	24.19	x	0.63	x	0.7	=	30.75	(74)
North 0.9	x 0.77	×	4.8	x	24.19	х	0.63	x	0.7	<u> </u>	35.48	(74)
North 0.9	x 0.77	Īx	4.16	x	13.12	×	0.63	x	0.7	-	16.68	(74)
North 0.9	x 0.77	×	4.8	х	13.12	x	0.63	x	0.7		19.24	(74)
North 0.9	x 0.77	×	4.16	X	8.86	X	0.63	x	0.7	=	11.27	(74)
North 0.9	x 0.77	×	4.8	x	8.86	x	0.63	x	0.7		13	(74)
West 0.9	x 0.77	×	2.72	x	19.64	x	0.63	x	0.7	=	16.33	(80)
West 0.9	x 0.77	x	2.72	x	38.42	X	0.63	x	0.7	=	31.94	(80)
West 0.9	x 0.77	x	2.72	x	63.27	X	0.63	х	0.7	=	52.6	(80)
West 0.9	x 0.77	×	2.72	x	92.28	x	0.63	x	0.7	=	76.71	(80)
West 0.9	x 0.77	×	2.72	X	113.09	X	0.63	x	0.7		94.01	(80)
West 0.9	x 0.77	×	2.72	x	115.77	x	0.63	x	0.7		96.24	(80)
West 0.9	x 0.77	×	2.72	x	110.22	x	0.63	x	0.7	_ =	91.62	(80)
West 0.9	x 0.77	×	2.72	x	94.68	X	0.63	x	0.7		78.7	(80)
West 0.9	x 0.77	×	2.72	x	73.59	x	0.63	x	0.7	-	61.17	(80)
West 0.9	x 0.77	x	2.72	x	45.59	x	0.63	x	0.7		37.9	(80)
West 0.9	x 0.77	×	2.72	x	24.49	x	0.63	x	0.7	=	20.36	(80)
West 0.9	× 0.77	×	2.72	x	16.15	x	0.63	x	0.7		13.43	(80)
						-						
Solar gains	in watts, calcu	ulated	for each mon	th		(83)m	n = Sum(74)m .	(82)m			_	
(83)m= 45.4		47.15	228.59 298.6		15.26 296.11	240	.93 174.86	104.13	56.28	37.7		(83)
			(84)m = (73) r	<u> </u>	<u> </u>						7	
(84)m= 434.5	56 474.69 52	21.88	583.43 633.3	6 6	30.61 598.82	549	.32 493.44	442.8	418	416.6	J	(84)

7 Me	ean inter	nal temr	perature	(heating	ı season)								
	perature	·				•	from Tal	ole 9. Th	1 (°C)				21	(85)
•	ation fac	Ū	٠.			Ū		J.O O, 111	. (0)					(00)
Otino	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.91	0.77	0.61	0.67	0.9	0.98	1	1		(86)
Mear	internal	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				l	
(87)m=	19.62	19.75	20	20.35	20.69	20.91	20.98	20.96	20.79	20.38	19.94	19.6		(87)
Temr	perature	durina h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9. T	h2 (°C)	•			l	
(88)m=	19.87	19.87	19.87	19.88	19.88	19.89	19.89	19.89	19.89	19.88	19.88	19.87		(88)
Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)		!	•		ı	
(89)m=	1	0.99	0.99	0.96	0.87	0.67	0.47	0.53	0.83	0.97	0.99	1		(89)
Mear	internal	l temper	ature in	the rest	of dwelli	ina T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)			l	
(90)m=	18.04	18.23	18.59	19.11	19.57	19.83	19.88	19.88	19.71	19.15	18.52	18.02		(90)
									1	fLA = Livin	g area ÷ (4) =	0.37	(91)
Mear	n internal	l temper	ature (fo	r the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	A) x T2			'		'
	18.63	18.79	19.11	19.57	19.98	20.23	20.29	20.28	20.11	19.61	19.05	18.61		(92)
Apply	/ adjustn	nent to the	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opri <mark>ate</mark>				
(93)m=	18.63	18.79	19.11	19.57	19.98	20.23	20.29	20.28	20.11	19.61	19.05	18.61		(93)
8. Sp	ace hea	ting requ	uirement											
	i to the r					ned at st	ep 11 of	Table 9	o, <mark>s</mark> o tha	nt Ti <mark>,m=(</mark>	76)m an	d re-calc	ulate	
tne u	tilisation	Feb	or gains Mar			lun	lul	Aug	Sep	Oct	Nov	Dec		
Utilis	Jan_ ation fac			Apr	May	Jun	Jul	Aug	Зер	Oct	INOV	Dec		
(94)m=	1	0.99	0.98	0.96	0.87	0.71	0.52	0.59	0.85	0.97	0.99	1		(94)
Usefu	ىــــــــا يا gains,	hmGm .	, W = (9 ²	1)m x (8	4)m	<u> </u>		<u> </u>		<u> </u>	ļ.			
(95)m=	432.62	471.22	513.72	557.68	554.1	445.04	311.51	321.98	418.44	429.37	414.62	415.07		(95)
Mont	hly 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)
	loss rate					Lm , W :	=[(39)m	x [(93)m	– (96)m]		1	ı	
	1271.15				723.24	487.18	319.26	335.28	522.1	786.17		1267.35		(97)
-	e heating										r – –	004.00		
(98)m=	623.86	509.67	446.59	270.41	125.84	0	0	0	0	265.46	455.35	634.09	0004.00	(00)
_								lota	ı per year	(kWh/year	r) = Sum(9	8)15,912 =	3331.28	(98)
Spac	e heating	g require	ement in	kWh/m²	²/year								47.59	(99)
	ergy red		nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heating ion of sp	_	nt from so	econdar	v/supple	mentary	v system						0	(201)
			at from m			,	,	(202) = 1	- (201) =				1	(202)
Fract													•	\ - /
				-	` '			(204) = (2	02) x [1 –	(203)] =			1	(204)
Fract	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =				(204)
Fract Effici		tal heatii main spa	ng from	main syste	stem 1 em 1	g systen	n, %	(204) = (2	02) × [1 –	(203)] =			93.5 0	

	Jun Jul	Aug	Sep O	ct Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above)		<u> </u>		40 455.05	T 00 4 00		
623.86 509.67 446.59 270.41 125.84	0 0	0	0 265	46 455.35	634.09		(5.4.1)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (667.23 545.1 477.63 289.21 134.59 $	0 0	0	0 283	91 487.01	678.17		(211)
001.20 0.0.1 117.00 200.21 10.100	<u> </u>		(kWh/year) =S			3562.87	(211)
Space heating fuel (secondary), kWh/month							_
= {[(98)m x (201)] } x 100 ÷ (208)							
(215)m= 0 0 0 0 0	0 0	0 Total	$\begin{array}{c c} 0 & C \\ \hline \text{(kWh/year)} = S \end{array}$	-	0	_	7(045)
Water booting		TOlai	(KVVII/year) =3	um(213) _{15,10}	12	0	(215)
Water heating Output from water heater (calculated above)							
	38.13 132.81	145.53	145.21 163	27 172.45	184.9		_
Efficiency of water heater			<u> </u>		,	79.8	(216)
` '	79.8 79.8	79.8	79.8 86	1 87.29	87.84		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m							
` '	173.1 166.43	182.37	181.96 189	62 197.57	210.49		_
		Total	= Sum(219a) ₁			2275.03	(219)
Annual totals Space heating fuel used, main system 1				kWh/yea	r	kWh/year 3562.87	7
Water heating fuel used						2275.03] 7
						2275.03	_
Electricity for pumps, fans and electric keep-hot							(222.)
central heating pump:					30		(230c)
boiler with a fan-assisted flue					45		(230e)
Total electricity for the above, kWh/year		sum (of (230a)(230	(g) =		75	(231)
Electricity for lighting						321.47	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =	=			6234.37	(338)
12a. CO2 emissions – Individual heating systems	s including mi	icro-CHP					
	Energy		Em	ission fac	ctor	Emissions	
	kWh/year		kg (CO2/kWh		kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.216	=	769.58	(261)
Space heating (secondary)	(215) x			0.519	=	0	(263)
Water heating	(219) x			0.216	=	491.41	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =			1260.99	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.519	=	38.93	(267)
Electricity for lighting	(232) x			0.519	=	166.84	(268)
Total CO2, kg/year							
			sum of (265)(271) =	İ	1466.76	(272)
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3			sum of (265)(271) =		1466.76	(272)
TER =			sum of (265)(271) =		1466.76	(272)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: House Detachment: Mid-terrace 2019 Year Completed:

Floor Location: Floor area:

129 m² Floor 0 3 m

30 m² (fraction 0.233) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source	e:	Typ	oe:	GI	lazing:		Arg	on: I	rame:
DOO	R	Manufac	cturer	Solid	d					\	Vood
N		Manufac	cturer	Wind	dows	lov	w-E, En = 0.0	5, soft co	oat No		
S		Manufad	cturer	Wind	dows	lov	W-E, $En = 0.0$	5, soft co	oat No		

Storey height:

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
N		0.7	0.4	1	12.3	1
S		0.7	0.4	1	10.3	1

Type-Name: Location: Orient: Width: Height: Name: **DOOR** Worst case S Ν 0 Ν North 0 S S South 0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
N	42	12.3	29.7	0.15	0	False	N/A
S	44	12.7	31.3	0.15	0	False	N/A
Roof	46	0	46	0.11	0		N/A
Exposed	46			0.11			N/A
Internal Elements	3						

Party Elements

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

SAP Input

Ventilation:

Yes (As designed)

Pressure test: Ventilation:

Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Boiler Database

Database: (rev 498, product index 016888) Efficiency: Winter 79.9 % Summer: 90.0

Brand name: Worcester Model: Greenstar

Model qualifier: 34CDi Combi

(Combi boiler)
Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes Weather Compensator

Main heating Control:

Main heating Control:

Time and temperature zone control by suitable arrangement of plumbing and electrical

services

Control code: 2110

Secondary heating system:

Secondary heating system:

None

water neating

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No
Photovoltaics: None
Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma I		2		Strom Softwa				Vorsio	on: 1.0.5.51	
Software Name.	Stroma	- SAF 201		roperty	Address			1	VEISIO	JII. 1.0.5.51	
Address :				Toperty .	Address	. I louse	Sample	•			
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor					129	(1a) x		3	(2a) =	387	(3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	n)	129	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	387	(5)
2. Ventilation rate:											
	main heatin		econdar neating	ry	other		total			m³ per hou	ır
Number of chimneys	0	+ [0	7 + [0	= [0	X 4	40 =	0	(6a
Number of open flues	0	+	0	Ī + Ē	0	j = <u>c</u>	0	x	20 =	0	(6b
Number of intermittent fa	ans					 	0	x .	10 =	0	 (7a
Number of passive vents	3					F	0	x	10 =	0	` (7b
Number of flueless gas f						F	0	X 4	40 =	0	(7c
Nulliber of flueless gas i	1163					L	0			0	(/0
									Air ch	nanges <mark>per</mark> h	our
Infilt <mark>ration</mark> due to chimne	ys, flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l	been carried ou	t or is intend	ed, procee	ed to (17), o	otherwise o	continue fr	om (9) to ((16)			
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)
Additional infiltration) OF famata al		(12 12 12 12 12 12 12 12 12 12 12 12 12 1	. O OF fa				[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0 if both types of wall are p						•	uction			0	(11
deducting areas of openi	ings); if equal u	ser 0.35				·					
If suspended wooden		,	led) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, er	,									0	(13
Percentage of window Window infiltration	s and doors	draught s	rippea		0.25 - [0.2	v (14) ± 1	1001 -			0	(14
Infiltration rate					(8) + (10)	, ,	-	+ (15) =		0	(15
Air permeability value,	. a50. expres	sed in cub	oic metre						area	3	= (17
If based on air permeabi				•	•	•				0.15	(18
Air permeability value applie	-						is being u	sed			
Number of sides sheltered	∍d									2	(19
Shelter factor					(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21
Infiltration rate modified			1	1. 1	1	0		NI.	D	1	
Jan Feb	Mar Apı		Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
Monthly average wind sp		1	20	1 20	0.7	4	4.0	A F	4.7	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	:2)m ÷ 4										
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.16	otion rate	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1	
Calculate effec		change i	-	he appli	· ·	l -							
If mechanica	ıl ventila	tion:										0.5	(23
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [1 – (23c)) ÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (2	23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole he if (22b)m				•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural v				•	•				0.5]			_	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
2 Heat lance	and be	at Jaco											
3. Heat losses					Not An		Aust	_	A X I I		la comba		A V I.
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-valu kJ/m²·		A X k kJ/K
)oo <mark>rs</mark>					2.4	x	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				12.3	X	1/[1/(1)+	0.04] =	11.83	Ħ			(27
Vindows Type	2				10.3	X	1/[1/(1)+	0.04] =	9.9	Ħ			(27
loor					46	×	0.11		5.06	5 ,			(28
Valls Type1	42		12.3		29.7		0.15	=	4.46	=			(29
Valls Type2	44		12.7	=	31.3	x	0.15	= =	4.7	룩 ;		-	(29
Roof	46		0	=	46	X	0.11		5.06	륵 ;			(30
otal area of e					178	╡ ^	0.11		3.00				(31
for windows and			ffective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	ıe)+0.041 a	ns aiven in	paragrapi	h 3.2	(31
* include the area						a.co a a.og	, romana i	1(", • " a.a.	,	.c g	paragrap.		
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				44.36	(33
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	4718	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35
or design assess an be used instea				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge				using Ap	pendix k	<						26.7	(36
details of therma	,	•			•							20.1	(
otal fabric hea			, ,	,	,			(33) +	(36) =			71.06	(37
entilation hea	t 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= 34.14	33.73	33.32	31.29	30.88	28.85	28.85	28.44	29.66	30.88	31.7	32.51]	(38
leat transfer c	oefficier	nt, W/K			•	•	•	(39)m	= (37) + (3	38)m	•	-	
ioat tialioloi o									· · · · · · · · · · · · · · · ·				
39)m= 105.2	104.79	104.39	102.35	101.94	99.91	99.91	99.5	100.72	101.94	102.76	103.57		

Heat loss parameter (HLP), W/m²K									(40)m					
(40)m=	0.82	0.81	0.81	0.79	0.79	0.77	0.77	0.77	0.78	0.79	0.8	0.8		
Numbe	or of dov	o in ma	oth /Tob	lo 1o\					1	Average =	Sum(40) ₁ .	12 /12=	0.79	(40)
Numbe	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
、														, ,
4 Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ar·	
				1011101111								144411111111111111111111111111111111111	ан	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (ΓFA -13.		89		(42)
Reduce	the annua	ıl average	ater usaç hot water	usage by	5% if the d	welling is	designed t			se target o		2.89		(43)
not more	that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)				,			
I lot water	Jan	Feb	Mar day for ea	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		•						· <i>′</i>	400.04	10105	400.07	440.40		
(44)m=	113.18	109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07 m(44) ₁₁₂ =	113.18	1234.72	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600					1234.72	(44)
(45)m=	167.85	146.8	151.48	132.07	126.72	109.35	101.33	116.28	117.67	137.13	149.69	162.55		
										Γotal = Su	m(45) ₁₁₂ =		1618.91	(45)
			ng at point											(40)
(46)m= Water	25.18 storage	22.02 loss:	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
	_		includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage		eclared l	nce fact	or is kno	wn (k\A/k	n/day/):							(40)
•			m Table		טווא כו וכ	wii (Kvvi	i/uay).					0		(48) (49)
•			storage		ear			(48) x (49)) =			0		(50)
•			eclared o	-		or is not		(10) X (10)	_			0		(30)
		_	factor fr		e 2 (kWl	n/litre/da	ıy)					0		(51)
	nunity h e factor	•	ee section	on 4.3										(50)
			m Table	2b							-	0		(52) (53)
•			storage		ar			(47) x (51)) x (52) x (53) =		0		(54)
٠,	(50) or (•	, 100011/90	Jui			(, / (0.)	/	,		0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	кH	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	m Table	 e 3							0		(58)
	-	•	culated f			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m										
(61)m= 50.96 46.03 50.96 49.32 50.96 49.32 50.96 49.32 50.96 49.32 50.96 (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= 218.81 192.83 202.44 181.38 177.68 158.67 152.29 167.24 166.98 188.09 199 213.51 (62)										
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)										
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 (63)										
FHRS 22.65 19.62 19.53 16.37 13.93 10.6 9.82 11.27 11.4 16.79 19.53 22.21 (63) ((G2)									
Output from water heater										
(64)m= 193.68 170.97 180.44 162.62 161.28 145.68 140 153.5 153.19 168.83 177.08 188.83										
Output from water heater (annual) ₁₁₂ 1996.09 (64)										
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]										
(65)m= 68.55 60.32 63.11 56.24 54.87 48.69 46.43 51.4 51.45 58.34 62.1 66.79 (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= 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 (66)										
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5										
(67)m= 27.82 24.71 20.09 15.21 11.37 9.6 10.37 13.48 18.1 22.98 26.82 28.59 (67)										
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5										
(68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43 (68)										
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5										
(69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 (69)										
Pumps and fans gains (Table 5a)										
(70)m= 3 3 3 3 3 3 3 3 3 3 3 (70)										
Losses e.g. evaporation (negative values) (Table 5)										
(71)m= -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69										
Water heating gains (Table 5)										
(72)m= 92.14 89.76 84.82 78.11 73.76 67.62 62.41 69.09 71.46 78.41 86.25 89.77 (72)										
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$										
(73)m= 485.85 483.44 466.14 438.04 409 381.52 363.99 370.71 385.45 413.78 446.3 471.17 (73)										
6. Solar gains:										
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.										
Orientation: Access Factor Area Flux g_ FF Gains										
Table 6d m² Table 6a Table 6b Table 6c (W)										
North 0.9x 0.77 x 12.3 x 10.63 x 0.4 x 0.7 = 25.38 (74)										
North 0.9x 0.77 x 12.3 x 20.32 x 0.4 x 0.7 = 48.5 (74)										
North 0.9x 0.77 x 12.3 x 34.53 x 0.4 x 0.7 = 82.41 (74)										
North 0.9x 0.77 x 12.3 x 55.46 x 0.4 x 0.7 = 132.38 (74)										

	_		_		_		_						
North	0.9x	0.77	X	12.3	X	74.72	X	0.4	X	0.7	=	178.32	(74)
North	0.9x	0.77	X	12.3	X	79.99	X	0.4	X	0.7	=	190.9	(74)
North	0.9x	0.77	X	12.3	X	74.68	X	0.4	X	0.7	=	178.23	(74)
North	0.9x	0.77	X	12.3	X	59.25	X	0.4	X	0.7	=	141.4	(74)
North	0.9x	0.77	X	12.3	x	41.52	X	0.4	x	0.7	=	99.09	(74)
North	0.9x	0.77	X	12.3	x	24.19	X	0.4	x	0.7	=	57.73	(74)
North	0.9x	0.77	X	12.3	x	13.12	X	0.4	x	0.7	=	31.31	(74)
North	0.9x	0.77	X	12.3	x	8.86	X	0.4	x	0.7	=	21.16	(74)
South	0.9x	0.77	X	10.3	x	46.75	X	0.4	x	0.7	=	93.44	(78)
South	0.9x	0.77	X	10.3	x	76.57	X	0.4	x	0.7	=	153.03	(78)
South	0.9x	0.77	X	10.3	x	97.53	X	0.4	x	0.7	=	194.93	(78)
South	0.9x	0.77	X	10.3	x	110.23	X	0.4	x	0.7	=	220.32	(78)
South	0.9x	0.77	X	10.3	x	114.87	X	0.4	x	0.7	=	229.58	(78)
South	0.9x	0.77	x	10.3	x	110.55	X	0.4	x	0.7	=	220.94	(78)
South	0.9x	0.77	X	10.3	x	108.01	X	0.4	x	0.7	=	215.87	(78)
South	0.9x	0.77	X	10.3	x	104.89	X	0.4	×	0.7	=	209.64	(78)
South	0.9x	0.77	x	10.3	x	101.89	X	0.4	x	0.7	=	203.63	(78)
South	0.9x	0.77	X	10.3	X	82.59	Х	0.4	X	0.7	=	165.06	(78)
South	0.9x	0.77	x	10.3	x	55.42	x	0.4	x	0.7	_	110.76	(78)
South	0.9x	0.77	x	10.3	х	40.4	, x	0.4	x	0.7	_ =	80.74	(78)
							7		_				
Sola <mark>r g</mark>	ains in	watts, calcu	ated	for each mor	ith		(83)m	n = Sum(74)m	(<mark>8</mark> 2)m				
Solar g (83)m=	ains in 118.82		ated 7.35	for each mor 352.69 407.9		11.84 394.1	(83)m		(82)m 222.7		101.9		(83)
(83)m=	118.82	201.53 277	7.35		1 4		ì				101.9		(83)
(83)m=	118.82	201.53 277 nternal and	7.35	352.69 407.9	n + (ì	.05 302.72		9 142.07	101.9 573.07		(83) (84)
(83)m= Total g	118.82 ains — i 604.67	201.53 277 nternal and s 684.97 743	7.35 solar 3.48	$352.69 407.9 \\ (84) m = (73) i$	n + (83)m , watts	351	.05 302.72	222.7	9 142.07	1		` ,
(83)m= Total g (84)m= 7. Mea	118.82 ains — i 604.67 an inter	201.53 277 nternal and s 684.97 743 nal tempera	7.35 solar 3.48 ture (352.69 407.9 (84)m = (73)i 790.73 816.9 (heating seas	n + (n + (n) 7	83)m , watts	721	.75 688.16	222.7	9 142.07	1	21	` ,
(83)m= Total g (84)m= 7. Mean	118.82 ains — i 604.67 an inter erature	201.53 277 nternal and s 684.97 743 nal tempera during heati	7.35 solar 3.48 ture (352.69 407.9 (84)m = (73)i 790.73 816.9 (heating seas	n + (n + (n) 7	93.36 758.1 area from Tal	721	.75 688.16	222.7	9 142.07	1	21	(84)
(83)m= Total g (84)m= 7. Mean	118.82 ains — i 604.67 an inter erature	201.53 277 nternal and s 684.97 743 rnal tempera during heati	7.35 solar 3.48 ture (352.69 407.9 (84)m = (73)i 790.73 816.9 (heating seaseriods in the I	n + (n + (n) 7 on) iving ,m (s	93.36 758.1 area from Tal	721 ble 9	.75 688.16	222.7	9 142.07 7 588.36	1	21	(84)
(83)m= Total g (84)m= 7. Mean	118.82 ains — i 604.67 an intererature tion fac	201.53 277 nternal and s 684.97 743 mal tempera during heati ctor for gains Feb N	7.35 solar 3.48 ture (ng pe	352.69 407.9 (84)m = (73)n 790.73 816.9 (heating seaseriods in the leaving area, h1	n + (n + (n) n + (n) n (iving ,m (s	93.36 758.1 area from Talee Table 9a)	721 ble 9	.75 688.16 , Th1 (°C)	222.7	9 142.07 7 588.36	573.07	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	ains – i 604.67 an inter erature tion fact Jan	201.53 277 nternal and s 684.97 743 mal tempera during heati etor for gains Feb N	7.35 solar 3.48 ture (ng pe for li	352.69 407.9 (84)m = (73)i 790.73 816.9 (heating seaseriods in the living area, h1 Apr Ma 0.98 0.93	on) iving ,m (s	93.36 758.1 area from Talee Table 9a) Jun Jul	351 721 ble 9	.75 688.16 , Th1 (°C) ug Sep	222.7° 636.5	9 142.07 7 588.36 Nov	573.07 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	ains – i 604.67 an inter erature tion fact Jan	201.53 277 nternal and s 684.97 743 nal tempera during heati ctor for gains Feb N 1	7.35 solar 3.48 ture (ng pe for li	352.69 407.9 (84)m = (73)i 790.73 816.9 (heating seaseriods in the living area, h1 Apr Ma 0.98 0.93	n + (n + (n) iving ,m (s y	93.36 758.1 area from Talee Table 9a) Jun Jul 0.76 0.57	351 721 ble 9	.75 688.16 , Th1 (°C) ug Sep 0.88 Table 9c)	222.7° 636.5	9 142.07 7 588.36 Nov	573.07 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	ains – i 604.67 an interestature tion fact Jan 1 interna 20.11	201.53 277 nternal and s 684.97 743 nal tempera during heati ctor for gains Feb N 1 I temperatur 20.22 20	r.35 solar solar ture (ng pe for li far 1 e in li	352.69 407.8 (84)m = (73)i 790.73 816.9 (heating seaseriods in the living area, h1 Apr Ma 0.98 0.93 iving area T1 20.64 20.8	n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (83)m , watts 93.36 758.1 area from Talee Table 9a) Jun Jul 0.76 0.57 ow steps 3 to 70.97 21	351 721 ble 9 A 0.6 7 in T 20.	.75 688.16 , Th1 (°C) ug Sep 62 0.88 Table 9c) 99 20.93	222.7 636.5 Oct 0.99	9 142.07 7 588.36 Nov	573.07 Dec 1	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	ains – i 604.67 an interestature tion fact Jan 1 interna 20.11	201.53 277 nternal and s 684.97 743 nal tempera during heati etor for gains Feb N 1 I temperatur 20.22 20 during heati	r.35 solar solar ture (ng pe for li far 1 e in li	352.69 407.8 (84)m = (73)i 790.73 816.9 (heating seaseriods in the living area, h1 Apr Ma 0.98 0.93 iving area T1 20.64 20.8	11 4 11 7 11 7 11 7 17 7 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1	93.36 758.1 area from Talee Table 9a) Jun Jul 0.76 0.57 w steps 3 to 7	351 721 ble 9 A 0.6 7 in T 20.	.75 688.16 , Th1 (°C) ug Sep 62 0.88 Table 9c) 99 20.93 9, Th2 (°C)	222.7 636.5 Oct 0.99	9 142.07 7 588.36 Nov 1	573.07 Dec 1	21	(84)
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(83)m= Total g (84)m= 7. Mean (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	ains – i 604.67 an interestion factor of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the	temperatur 20.22 20 during heating 20.24 20 during heating 1 0. ltemperatur 19.19 19 ltemperatur 19.43 19	r.35 solar 3.48 ture (ng pe for li lar 1 e in li 0.4 ng pe .25 for re 99 e in t .45	352.69 407.8 (84)m = (73)i 790.73 816.9 (heating seaseriods in the living area, h1 Apr Ma 0.98 0.93 iving area T1 20.64 20.8 eriods in rest 20.26 20.20 est of dwelling 0.98 0.9 he rest of dwelling 19.81 20.1	1 4 4 1 7 7 7 1 1 7 7 7 1 1 7 7 7 1 1 7 7 1 1 7 7 1 7 1 1 7 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	93.36 758.1 area from Talee Table 9a) Jun Jul 0.76 0.57 ow steps 3 to 70.20.97 21 velling from Tale0.28 20.28 m (see Table 0.69 0.48 T2 (follow steps 20.26 20.27	721 721 721 721 721 721 721 721	.75 688.16 .75 688.16 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75 .75	222.7 636.5 Oct 0.99 20.66 20.26 0.98 e 9c) 19.85 LA = Lin	142.07 588.36 Nov 1 20.35 19.38 Ving area ÷ (-	Dec 1 20.09 20.25 1		(84) (85) (86) (87) (88) (89)

													Ī	
(93)m=	19.27	19.43	19.67	20.01	20.28	20.42	20.44	20.44	20.38	20.04	19.61	19.26		(93)
			uirement					-			-0)			
			ernai ter or gains	•		ed at ste	ep 11 of	l able 9	b, so tha	t II,m=(76)m an	d re-cald	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac		ains, hm					1 3					l	
(94)m=	1	1	0.99	0.97	0.9	0.71	0.5	0.55	0.83	0.98	1	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m		Į.				l.	l.		
(95)m=	604.04	683.18	737.96	769.34	735.57	562.33	382.21	399.26	573.84	623.4	586.8	572.66		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			•	
(97)m=		1522.84	1375.2	1136.66	874.5	581.79	383.86	402.26	632.16	962.34	1285.31	1560.01		(97)
Space		<u> </u>	ı			Wh/mon	th = 0.02	24 x [(97)m – (95		r e		•	
(98)m=	722.59	564.25	474.11	264.47	103.36	0	0	0	0	252.17	502.93	734.59		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	3618.48	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								28.05	(99)
9a. En	ergy rec	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:					J		, ,					
Fracti	ion of sp	ace hea	it from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from n	nain syst	em(s)			(202) = 1	(201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat										93	(206)
			ry/suppl			system	n %						0] (208)
								Δ	Cara	0=4	Nierr	D.,		」` ′
Snace	Jan	Feb	Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Opaci	722.59	564.25	474.11	264.47	103.36	0	0	0	0	252.17	502.93	734.59		
(011\m			<u> </u>								002.00		l	(244)
(211)11	776.98	606.72	4)] } x 1 509.79	284.38	111.14	0	0	0	0	271.15	540.78	789.89	1	(211)
	770.00	000.72	000.70	204.00	111.17				l (kWh/yea				3890.84	(211)
Space	o bootin	a fuol (c	ocondor	v) k\//b/	month					(/15,1012	2	3030.04	
•		•	econdar 00 ÷ (20	• •	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
			!					Tota	l II (kWh/yea	ar) =Sum(2	1 215) _{15.1012}	<u>-</u>	0	(215)
Water	heating	1												」 ` ′
	_		ter (calc	ulated al	oove)									
	193.68	170.97	180.44	162.62	161.28	145.68	140	153.5	153.19	168.83	177.08	188.83		
Efficier	ncy of w	ater hea	iter					•			•	•	79.9	(216)
(217)m=	87.66	87.43	86.97	85.87	83.56	79.9	79.9	79.9	79.9	85.66	87.13	87.73		(217)
Fuel fo	r water	heating,	kWh/mo	onth				•	•		•	•	•	
) ÷ (217)										ı	
(219)m=	220.95	195.56	207.47	189.38	193.01	182.33	175.22	192.11	191.72	197.09	203.23	215.23		7
_								I ota	I = Sum(21				2363.31	(219)
	al totals	fuelves	ed, main	evetem	1					k'	Wh/year	•	kWh/year	7
Space	neaung	iu c i ust	a, main	ayal e III	ı								3890.84	_

Material and a first and					1
Water heating fuel used				2363.31	_
Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or posi	tive input from outside		230.17		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230	0a)(230g) =		305.17	(231)
Electricity for lighting				491.27	(232)
Total delivered energy for all uses (211)(221) + ((231) + (232)(237b) =			7050.58	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	otor	Emissions	
	Lileigy		ClOi	LIIIISSIUIIS	
	kWh/year	kg CO2/kWh		kg CO2/yea	ır
Space heating (main system 1)					r](261)
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	_
	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	(261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216 0.519 0.216	=	kg CO2/yea	(261)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	0.216 0.519 0.216	=	kg CO2/yea 840.42 0 510.47	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= = =	kg CO2/yea 840.42 0 510.47	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519	= = =	kg CO2/yea 840.42 0 510.47 1350.9	(261) (263) (264) (265) (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519 0.519	= = =	kg CO2/yea 840.42 0 510.47 1350.9 158.38 254.97	(261) (263) (264) (265) (267) (268)

				User D	etails:						
Assessor Name:	0 /	-0 A D 00 A			Strom				.,	40554	
Software Name:	Stroma I	FSAP 201	_		Softwa			1	Versic	n: 1.0.5.51	
Addross :			F	roperty	Aaaress	: House	Sample	1			
Address: 1. Overall dwelling dime	ensions:										
n everall aweiling all ne	priorono.			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor						(1a) x		3	(2a) =	387	, (3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	n)	129	(4)			_		
` Dwelling volume	, , , ,	, , , ,	, ,	´ <u></u>)+(3c)+(3c	d)+(3e)+	.(3n) =	387	(5)
2. Ventilation rate:											(-/
2. Ventuation rate.	main heatin		econdaneating	ry	other		total			m³ per hou	ır
Number of chimneys	0	+ [0	+ [0	= [0	X e	40 =	0	(6a
Number of open flues	0	+	0	Ī + Ē	0	=	0	x :	20 =	0	(6b
Number of intermittent fa	ans					Ī	4	x	10 =	40	(7a
Number of passive vents	3					Ī	0	x	10 =	0	(7b
Number of flueless gas f	ires					Ī	0	X ·	40 =	0	(70
						_			A in a b	ongos nor b	
		d force (6	(6b) (7	70) + (7b) + (70) -					nanges per h	_
Infiltration due to chimne If a pressurisation test has be						continue fr	40		÷ (5) =	0.1	(8)
Number of storeys in t			Ju, procee	u 10 (17),	<i>30110111100</i> 1	Jonana II	0111 (0) 10 ((10)		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0	.25 for stee	or timber	frame of	0.35 fo	r mason	y consti	ruction			0	(11
if both types of wall are p deducting areas of openi			ponding to	the great	er wall are	a (after					
If suspended wooden	• / .		led) 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	tripped							0	(14
Window infiltration					0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16
Air permeability value,				•	•	•	etre of e	envelope	area	5	(17
If based on air permeabi	-									0.35	(18
Air permeability value applie		ation test ha	s been do	ne or a de	gree air pe	rmeability	is being u	sed			–
Number of sides sheltere Shelter factor	∌a				(20) = 1 -	[0.075 x (*	19)] =			2	(19
Infiltration rate incorpora	ting shelter	factor			(21) = (18		. •/]			0.85	(20
Infiltration rate modified	•		4		,=., (10	, (==) =				0.3	(21
Jan Feb	Mar Ap	 	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1 3411	1 501	ı nug	l oob	1 000	1 .407	1 200	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		
		-1			1	ı	1	1		Į	
Wind Factor (22a)m = (2		1 4 00	I 0.05	I 0.05	I		1 4 00	1 440	4.40	1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35		
alculate effec		U	rate for t	he appli	cable ca	se	<u>!</u>			ļ			
If mechanica												0	(23
If exhaust air h		0		, ,	,	. `	,, .	`) = (23a)			0	(2:
If balanced with		•	•	•		,						0	(2:
a) If balance		i				- 	- ^ `	<u> </u>		` 	1 ` ` `	÷ 100]	-
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance		i				, , ,	i ,	<u> </u>	, 	` 	T -	I	(0
4b)m= 0	0	0	0	0		0	0	0	0	0	0		(2
c) If whole h				•	•		on from (c) = (22k		E (221	٥)			
4c)m = 0	0.5 x	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0	0	0		(2
											, ·		(2
d) If natural if (22b)n							0.5 + [(2		0.5]				
4d)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)	•		•		
5)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
2 Lloot loops	and be	at loss											
B. Heat losse	s and ne				Net Ar	200	U-valı	10	AXU		k-value		ΑΧk
LEMENT	area		Openin m		A ,r		W/m2		(W/		kJ/m²-l		kJ/K
oors					2.4	x	1	=	2.4				(2
/in <mark>dows</mark> Type	1				12.3	x1.	/[1/(1.4)+	0.04] =	16.31	Ħ			(2
/indows Type	2				10.3	x1	/[1/(1.4)+	0.04] =	13.66	Ħ			(2
oor					46	×	0.13	=	5.98	5 1		7 –	(2
/alls Type1	42		12.3		29.7	x	0.18	=	5.35	=		7 H	(2
/alls Type2	44		12.7	=	31.3	=	0.18	_	5.63	-		╡┝	(2
oof	46	_	0	=	46	^x	0.13	_	5.98	ᆿ ¦		╡	(3
otal area of e						╡^	0.13		3.90				(3
for windows and			ffective wi	ndow H-v	178 alue calcul	l lated using	n formula 1	/[(1/Ll-valı	ıe)+0 041 :	as given ir	naragranh	132	(0
include the area						atou uomg	, romaia r	I mo vale	10) 10.0 1] (ao givoirii	, paragrapi	. 0.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				55.3	(3
eat capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	4718	(3
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assess				construct	ion are no	t known pr	recisely the	indicative	values o	f TMP in T	able 1f		
an be used inste				ioina An	n an div l	/							——,,
hermal bridge	•	,			-	^						8.9	(3
details of therma otal fabric he		are not kn	OWII (30) =	= 0.03 X (3	(1)			(33) +	(36) =			64.2	(3
entilation hea		alculated	l monthly	/						(25)m x (5)	01.2	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 73.22	72.86	72.5	70.83	70.51	69.05	69.05	68.78	69.62	70.51	71.15	71.81		(3
eat transfer of	nefficie	nt \///K			I	I		(39)m	= (37) + ((38)m	1	ı	
	,つし 1110101	it, VV/[]						(55)111	-(01) -(Jujili			
9)m= 137.42	137.06	136.7	135.03	134.71	133.26	133.26	132.99	133.82	134.71	135.35	136.01		

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		
									,	Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Numbe	r i		nth (Tabl											
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/-		·										1-10/1- /		
4. VVa	iter neat	ing ener	gy requi	rement:								kWh/yea	ar:	
if TF	ed occu A > 13.9 A £ 13.9	0, N = 1	N + 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (⁻	ΓFA -13.		89		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the d	welling is	designed t			se target o		2.89		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ir	n litres per	day for ea	ch month	Vd,m = fac	ctor from T	able 1c x	(43)			•			
(44)m=	113.18	109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07	113.18		
Enorgy	contant of	hot water	used - cal	aulated me	anthly = A	100 v Vd r	n v nm v F	Tm / 2600			m(44) ₁₁₂ =		1234.72	(44)
		146.8	151.48	132.07	126.72					137.13	149.69	162.55		
(45)m=	167.85	140.0	131.46	132.07	120.72	109.35	101.33	116.28	117.67		m(45) ₁₁₂ =	<u> </u>	1618.91	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – ou	111(40)112 -		1010.51	(,
(46)m=	25.18	22.02	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
	storage		<i>7</i>		. \.									
			includin						ame ves	sel		0		(47)
	-	_	nd no ta hot wate		_			, ,	ers) ente	er 'O' in <i>(</i>	47)			
	storage		not mate	(0.000	iotairtai	.0040 00		0.0, 0	<i>y</i> . • (,			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
•			storage	-				(48) x (49)) =			0		(50)
•			eclared of factor fr	-								0		(51)
		_	ee section		0 2 (1.77)	1,1111 0, 00	· y /					0		(01)
Volume	e factor	from Ta	ble 2a									0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
٠.			storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
	(50) or (, ,	•						,			0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m	ī			
(56)m= If cylinde	0 er contains	0 dedicate	0 d solar sto	0 rage, (57)r	0 n = (56)m	0 x [(50) – (0 H11)] ÷ (50	0 0), else (57	0 7)m = (56)	0 m where (0 H11) is fro	m Appendix	Н	(56)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	m Table	3							0		(58)
	-	•	culated f			59)m = ((58) ÷ 36	65 × (41)	m					
	-		om Tabl							r thermo	stat)			
	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss	s calculated	for each	month (61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 50.		50.96	49.32	49.29	45.67	47.19	49.29	49.32	50.96	49.32	50.96		(61)
	required for	water he	eating ca	alculated	d for eacl	n month	(62)m =	: 0.85 × (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 218	` ,	202.44	181.38	176.01	155.02	148.52	165.57	166.98	188.09	199	213.51		(62)
Solar DHW in	put calculated	using App	endix G or	Appendix	ι κ Η (negati	ve quantity	/) (enter '0	i ' if no sola	r contribut	ion to wate	r heating)	l	
	onal lines if										0,		
(63)m=	0	0	0	0	0	0	0	0	0	0	0]	(63)
FHRS C) 0	0	0	0	0	0	0	0	0	0	0	1	(63) (G2)
Output from	n water hea	ter											
(64)m= 218	3.81 192.83	202.44	181.38	176.01	155.02	148.52	165.57	166.98	188.09	199	213.51		
		•			•		Out	out from wa	ater heate	r (annual)₁	12	2208.15	(64)
Heat gains	from water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)n	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m= 68.	55 60.32	63.11	56.24	54.46	47.78	45.49	50.98	51.45	58.34	62.1	66.79]	(65)
include (57)m in cal	culation of	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
,	al gains (see		` ,		-						•		
	gains (Table		<i>'</i>	, .									
	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 144		144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62		(66)
` ' -	ins (calcula						\vdash						
(67)m= 27.	<u>`</u>	19.59	14.83	11.09	9.36	10.11	13.15	17.64	22.4	26.15	27.87		(67)
	gains (calc				1								,
(68)m= 296	· '	291.83	275.33	254.49	234.91	221.83	218.75	226.5	243.01	263.85	283.43		(68)
Cooking ga	ains (calcula	ited in A	opendix	I equa	tion I 15	or I 15a	l also so	ee Table	5		ļ		
(69)m= 37.		37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	1	(69)
	d fans gains											I	
(70)m= 3		3	3	3	3	3	3	3	3	3	3]	(70)
` ′	. evaporatio				Į								(- /
	5.69 -115.69	<u> </u>	-115.69	-115.69	 	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	1	(71)
` ′	ting gains (1		110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	J	, ,
(72)m= 92.	 	84.82	78.11	73.19	66.36	61.14	68.53	71.46	78.41	86.25	89.77	1	(72)
` '			70.11	73.19	L		<u> </u>		<u> </u>	1)m + (72)		l	(12)
	nal gains =	465.63	437.66	408.16	380.01	362.47	369.81	384.99	413.2	445.63	470.46	1	(73)
6. Solar g		405.03	437.00	400.10	360.01	302.47	309.01	304.99	413.2	445.65	470.46		(13)
<u> </u>	are calculated	using sola	r flux from	Table 6a	and associ	iated equa	tions to co	nvert to th	e applicat	ole orientat	tion		
•	i: Access F	•	Area	rabio oa	Flu			g_	о арриоа	FF		Gains	
Chomation	Table 6d		m ²			ole 6a	Т	able 6b	Т	able 6c		(W)	
North 0.	.9x 0.77	х	12.	.3	x 1	0.63	x	0.63	x	0.7	=	39.97	(74)
	.9x 0.77	х	12.		-	0.32	x	0.63	x	0.7	=	76.39	(74)
	.9x 0.77	X	12.			4.53	X	0.63		0.7	_ =	129.8	(74)
	.9x 0.77	x	12.		-	5.46	x	0.63	- x	0.7	╡ -	208.49] (74)
	3.77						ı <u>L</u>						J, ,

North	0.9x	0.77	X	12.3	x	74.72	X	0.63	x	0.7	=	280.86	(74)
North	0.9x	0.77	X	12.3	x	79.99	X	0.63	x	0.7	=	300.67	(74)
North	0.9x	0.77	X	12.3	x	74.68	X	0.63	x	0.7	=	280.71	(74)
North	0.9x	0.77	X	12.3	X	59.25	X	0.63	X	0.7	=	222.71	(74)
North	0.9x	0.77	X	12.3	x	41.52	X	0.63	X	0.7	=	156.06	(74)
North	0.9x	0.77	x	12.3	x	24.19	X	0.63	x	0.7	=	90.93	(74)
North	0.9x	0.77	X	12.3	X	13.12	X	0.63	x	0.7	=	49.31	(74)
North	0.9x	0.77	X	12.3	X	8.86	X	0.63	×	0.7	_ =	33.32	(74)
South	0.9x	0.77	×	10.3	x	46.75	X	0.63	x	0.7	=	147.17	(78)
South	0.9x	0.77	X	10.3	X	76.57	X	0.63	x	0.7	=	241.02	(78)
South	0.9x	0.77	x	10.3	x	97.53	X	0.63	x	0.7	=	307.02	(78)
South	0.9x	0.77	x	10.3	x	110.23	X	0.63	x	0.7	=	347	(78)
South	0.9x	0.77	X	10.3	X	114.87	X	0.63	x	0.7	=	361.59	(78)
South	0.9x	0.77	x	10.3	x	110.55	x	0.63	x	0.7	<u> </u>	347.98	(78)
South	0.9x	0.77	x	10.3	x	108.01	x	0.63	x	0.7	<u> </u>	340	(78)
South	0.9x	0.77	X	10.3	x	104.89	x	0.63	x	0.7	=	330.19	(78)
South	0.9x	0.77	x	10.3	x	101.89	x	0.63	x	0.7	<u> </u>	320.72	(78)
South	0.9x	0.77	x	10.3	X	82.59	Х	0.63	X	0.7		259.96	(78)
South	0.9x	0.77	x	10.3	x	55.42	x	0.63	х	0.7	=	174.44	(78)
South	0.9x	0.77	x	10.3	х	40.4	Ī 🖈	0.63	х	0.7	<u> </u>	127.17	(78)
							7						
Solar g	ains in	watts, calcul	ated	for each moi	nth		(83)m	n = Sum(74)m.	(8 <mark>2</mark>)m				
Solar g (83)m=			ated 3.82	for each moi		648.65 620.71	(83)m 552		(82)m 350.89		160.49	1	(83)
(83)m=	187.14	317.41 436	6.82		45 6		``		. ,		160.49		(83)
(83)m=	187.14	317.41 436 nternal and s	6.82	555.49 642.	45 6 m + (``	2.9 476.78	. ,	9 223.75	160.49]	(83) (84)
(83)m= [Total ga (84)m= [187.14 ains — i 672.29	317.41 436 nternal and s 800.23 902	6.82 solar 2.45	555.49 642. (84)m = (73)	45 6 m + (83)m , watts	552	2.9 476.78	350.89	9 223.75	<u> </u>]	
(83)m= Total gas (84)m= 7. Mes	187.14 ains — i 672.29 an inter	317.41 436 nternal and s 800.23 902 nal temperal	5.82 solar 2.45 ture (555.49 642. (84)m = (73) 993.15 1050 heating seas	45 6 m + (61 1 son)	83)m , watts	922	2.9 476.78 2.7 861.77	350.89	9 223.75	<u> </u>	21	
(83)m= [Total g: (84)m= [7. Me: Tempe	187.14 ains — i 672.29 an inter	317.41 436 nternal and s 800.23 902 nal temperal during heati	solar 2.45 ture (555.49 642. (84)m = (73) 993.15 1050 (heating seaseriods in the	45 6 m + (61 1 son)	83)m , watts 028.66 983.18	922 able 9	2.9 476.78 2.7 861.77	350.89	9 223.75	<u> </u>	21	(84)
(83)m= [Total g: (84)m= [7. Me: Tempe	187.14 ains — i 672.29 an inter	317.41 436 nternal and s 800.23 902 nal temperal during heati	solar 2.45 ture (555.49 642. (84)m = (73) 993.15 1050 (heating seaseriods in the	m + (61 1 60n) living ,m (s	83)m , watts 028.66 983.18 area from Ta	922 able 9	2.9 476.78 2.7 861.77	350.89	9 223.75 669.38	<u> </u>	21	(84)
(83)m= [Total g: (84)m= [7. Me: Tempe	187.14 ains – i 672.29 an inter erature tion fac	317.41 436 nternal and s 800.23 902 nal temperal during heati	5.82 Solar 2.45 ture (ng pe for li	555.49 642. (84) m = (73) 993.15 1050 (heating seaseriods in the twing area, h1	45 6 m + (61 1 son) living ,m (s	83)m , watts 028.66 983.18 area from Ta see Table 9a)	922 able 9	2.9 476.78 2.7 861.77 , Th1 (°C)	350.8s 764.1	9 223.75 669.38	630.94	21	(84)
(83)m= Total graph (84)m= Temporal Utilisa (86)m=	187.14 ains – i 672.29 an inter erature tion fac Jan 1	317.41 436 nternal and s 800.23 902 nal temperal during heati etor for gains Feb N 1 0.	solar 2.45 ture (ng pe for li	555.49 642. (84)m = (73) 993.15 1050 (heating seaseriods in the ving area, h1 Apr Ma 0.97 0.9	m + (m + (61 1 son) living ,m (s	83)m , watts 028.66 983.18 area from Ta see Table 9a) Jun Jul 0.76 0.58	922 able 9	2.9 476.78 2.7 861.77 , Th1 (°C) ug Sep 64 0.87	350.89 764.1	9 223.75 669.38 Nov	630.94 Dec	21	(84)
(83)m= Total graph (84)m= Temporal Utilisa (86)m=	187.14 ains – i 672.29 an inter erature tion fac Jan 1	317.41 436 nternal and s 800.23 902 nal temperated during heatiestor for gains Feb M 1 0.4	solar 2.45 ture (ng pe for li	555.49 642. (84)m = (73) 993.15 1050 (heating seaseriods in the ving area, h1 Apr Ma 0.97 0.9	m + (61 1 son) living ,m (s	83)m , watts 028.66 983.18 area from Ta see Table 9a) Jun Jul	922 able 9	2.9 476.78 2.7 861.77 , Th1 (°C) ug Sep 64 0.87 Table 9c)	350.89 764.1	9 223.75 669.38 Nov	630.94 Dec	21	(84)
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_							•				•	•	•	
(93)m=	18.74	18.95	19.27	19.69	20.04	20.23	20.27	20.27	20.16	19.72	19.15	18.71		(93)
			uirement				_							
			ernal ter or gains :	•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
∟ Utilisat			ains, hm		iviay	Odii	<u> </u>	l mag	СОР	001	1101			
(94)m=	1	0.99	0.99	0.96	0.87	0.69	0.49	0.55	0.82	0.97	1	1		(94)
∟ Useful	gains,	hmGm	, W = (94	1)m x (84	4)m	<u> </u>	<u>!</u>				<u>I</u>		ı	
(95)m=	670.92	795.98	889.66	949.93	915.67	709.18	483.61	504.86	705.39	741.09	666.19	630.02		(95)
Month	y avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			•	
(97)m=	1984	1926.05	1746.33	1457.35	1123.89	750.62	489.02	514.26	811.06	1227.95	1631.17	1973.2		(97)
Space	heating	g require				Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m	1	•	
(98)m=	976.93	759.4	637.36	365.34	154.92	0	0	0	0	362.23	694.79	999.33		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	4950.29	(98)
Space	heating	g require	ement in	kWh/m²	?/year								38.37	(99)
9a. Ene	rgy req	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space	heatin	ıg:					J		,					
Fractio	n of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fra <mark>ctio</mark>	n of sp	ace hea	t from m	ain syst	em(s)			(202) = 1	(201) =				1	(202)
Fractio	n of tot	al heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of r	nain s <mark>pa</mark>	ace heat	ing syste	em 1								93.4	(206)
			ry/supple			system	ղ. %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ar
Space			ement (c				Jui	Aug	ОСР	Oct	1404	DCC	KVVIII y C	ai
· -	976.93	759.4	637.36	365.34	154.92	0	0	0	0	362.23	694.79	999.33		
∟ : (211)m	= {[(98)	m x (20	 4)1 } x 1	00 ÷ (20	16)		ļ	<u> </u>			<u> </u>			(211)
` ′ —	1045.96	•	682.4	391.15	165.86	0	0	0	0	387.83	743.88	1069.94		(=)
L								Tota	l I (kWh/yea	ar) =Sum(2	L 211) _{15.1012}	 =	5300.1	(211)
Space	heating	n fuel (s	econdar	v) kWh/	month									
•	•	`	00 ÷ (20	, , .										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
_								Tota	I (kWh/yea	ar) =Sum(2	215),,,,5,10,12	=	0	(215)
Water h	neating													_
Output_f	from wa	ater hea	ter (calc	ulated a	bove)		•				•		•	
	218.81	192.83	202.44	181.38	176.01	155.02	148.52	165.57	166.98	188.09	199	213.51		_
Efficiend	cy of wa	ater hea	ter										80.3	(216)
(217)m=	88.37	88.15	87.74	86.78	84.73	80.3	80.3	80.3	80.3	86.67	87.94	88.44		(217)
		•	kWh/mo											
(219)m = 1		<u>m x 100</u> 218.74) ÷ (217) 230.73	m 209.02	207.73	193.05	184.96	206.18	207.95	217.01	226.3	241.41		
(210)111-	77.01	210.14	200.70	200.02	201.10	100.00	104.30		I = Sum(2		220.0	<u>∠</u> -⊤1. " †1	2590.68	(219)
Annual	totale							. 5 10			Wh/year		kWh/year	
		fuel use	ed, main	system	1					N.	· · · · · y cal		5300.1	7
-	,			-									1	_

					_
Water heating fuel used				2590.68]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230	a)(230g) =		75	(231)
Electricity for lighting				478.94	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			8444.72	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	1144.82	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	559.59	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1704.41	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	248.57	(268)
Total CO2, kg/year TER =	sun	n of (265)(271) =		1991.9	(272)

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: House Mid-terrace Detachment: 2019 Year Completed:

Floor Location: Floor area:

> Storey height: 129 m² 3 m

Floor 0

30 m² (fraction 0.233) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
DOO	R	Manufacturer	Solid			Wood
N		Manufacturer	Windows	low-E, En = 0.05, soft coa	it No	
S		Manufacturer	Windows	low-E, En = 0.05, soft coa	it No	
Ε		<u>M</u> anufactur <mark>er</mark>	Windows	low-E, $En = 0.05$, soft coa	it No	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
N		0.7	0.4	1	12.3	1
S		0.7	0.4	1	10.3	1
E		0.7	0.4	1	7	1

Name: DOOR	Type-Name:	Location: S	Orient: Worst case	Width: 0	Height: 0
N		N	North	0	0
S		S	South	0	0
E		E	East	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
N	42	12.3	29.7	0.15	0	False	N/A
S	44	12.7	31.3	0.15	0	False	N/A
E	91	7	84	0.15	0	False	N/A
Roof	46	0	46	0.11	0		N/A
Exposed	46			0.11			N/A

Internal Elements

Party Elements

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Boiler Database

Database: (rev 498, product index 016888) Efficiency: Winter 79.9 % Summer: 90.0

Brand name: Worcester

Model: Greenstar

Model qualifier: 34CDi Combi

(Combi boiler)

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes Weather Compensator

Main heating Control:

Main heating Control: Time and temperature zone control by suitable arrangement of plumbing and electrical

services

Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English

Wind turbine: No Photovoltaics: None Assess Zero Carbon Home: No



				User D	etails:						
Assessor Name: Software Name:	Stroma	FSAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
John Ware Hame.	Otroma	10/11 201		roperty	Address			2	VOISIO	71. 1.0.0.01	
Address :				roporty .	rtaarooo	110000	Campio	_			
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor					129	(1a) x		3	(2a) =	387	(3a
Total floor area TFA = (1	a)+(1b)+(1c	c)+(1d)+(1e	e)+(1ı	n)	129	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	387	(5)
2. Ventilation rate:											
	main heatir		econdar neating	у	other		total			m³ per hou	ır
Number of chimneys	0		0] + [0	=	0	X 4	40 =	0	(6a
Number of open flues	0	- +	0	Ī + Ē	0	ī - Ē	0	x	20 =	0	(6b
Number of intermittent fa	ans					,	0	x .	10 =	0	 (7a
Number of passive vents	3					L	0	x	10 =	0	` (7b
Number of flueless gas f						Ļ			40 =	-	=
Nulliber of flueless gas f	1163					L	0		10 -	0	(70
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimne	ys, flues an	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l						continue fr					` ′
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0 if both types of wall are p						•	ruction			0	(11
deducting areas of openi			portaing to	ine great	er wall are	a (anter					
If suspended wooden	floor, enter	0.2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, er	,									0	(13
Percentage of window	s and doors	draught st	tripped		0.05 [0.0	v (1.4) · .4	1001			0	(14
Window infiltration Infiltration rate					0.25 - [0.2] (8) + (10)	, ,	-	L (15) —		0	(15
Air permeability value,	a50 eynre	esed in cut	nic metre						area	0	(16
If based on air permeabi				•	•	•	ctro or o	rivelope	arca	0.15	(18
Air permeability value applie	-						is being u	sed		0.10	(
Number of sides sheltere	ed									2	(19
Shelter factor					(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21
Infiltration rate modified		- i	1	l			-			1	
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	<u> </u>		1	1	1		1		<u> </u>	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	

djusted infiltra	tion rat	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m				•	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
<i>alculate effec</i> If mechanica		-	iale ioi l	пе аррп	cable ca	13 <i>E</i>						0.5	(23
If exhaust air he	at pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				79.05	
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)		`
.4a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	лV) (24b)m = (22	2b)m + (23b)		•	
!4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho				•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v				•	•				0.5]	•		•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss	paramet	er:							_	_	
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
oors					2.4	х	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				12.3	x	1/[1/(1)+	0.04] =	11.83				(2
Vindows Type	2				10.3	x	1/[1/(1)+	0.04] =	9.9				(2
Vindows Type	3	'			7	х	1/[1/(1)+	0.04] =	6.73				(2
loor					46	Х	0.11	= [5.06				(28
/alls Type1	42		12.3		29.7	Х	0.15	= [4.46				(29
/alls Type2	44		12.7		31.3	Х	0.15	= [4.7				(29
/alls Type3	91		7		84	Х	0.15	= [12.6				(29
oof	46		0		46	X	0.11	= [5.06				(30
otal area of el	ements	, m²			269								(3
for windows and include the area						lated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	3.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)) + (32) =				63.69	(3
eat capacity (•	,						((28)	(30) + (32	2) + (32a).	(32e) =	5894	(3
hermal mass	•	•		•					tive Value			250	(3:
or design assessi an be used instea	nd of a de	tailed calc	ulation.				ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge	•	,		• .	•	K					,	40.35	(3
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			104.04	4 (3
								(20)	0.00				
entilation hea	t loss ca	alculated	d monthly	/				(36)111	$= 0.33 \times ($	(25)m x (5))		

(38)m= 34.14 33.73 33.32 31.29 30.88 28.85	28.85 28.44	29.66 30.88	31.7	32.51		(38)
Heat transfer coefficient, W/K	<u> </u>	(39)m = (37) + (37)				
(39)m= 138.18 137.77 137.37 135.33 134.92 132.89	132.89 132.48	133.7 134.92		136.55		7(20)
Heat loss parameter (HLP), W/m²K	<u>, </u>	Average = (40)m = (39)m ÷		12 /12=	135.23	(39)
(40)m= 1.07 1.07 1.06 1.05 1.05 1.03	1.03 1.03	1.04 1.05	1.05	1.06		7
Number of days in month (Table 1a)		Average =	Sum(40) ₁₁	12 /12=	1.05	(40)
Jan Feb Mar Apr May Jun	Jul Aug	Sep Oct	Nov	Dec		
(41)m= 31 28 31 30 31 30	31 31	30 31	30	31		(41)
		l .				
4. Water heating energy requirement:				kWh/year:		
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TF if TFA £ 13.9, N = 1	A -13.9)2)] + 0.0	013 x (TFA -13.	2.8 9)	9		(42)
Annual average hot water usage in litres per day Vd,ave	erage = (25 x N)	+ 36	102.	.89		(43)
Reduce the annual average hot water usage by 5% if the dwelling is of	designed to achieve a					` ,
not more that 125 litres per person per day (all water use, hot and colo						
Jan Feb Mar Apr May Jun Hot water usage in litres per day for each month Vd, m = factor from To	Jul Aug	Sep Oct	Nov	Dec		
		100.84 104.95	100.07	112 10		
(44)m= 113.18 109.07 104.95 100.84 96.72 92.6	92.6 96.72	Total = Sur	109.07	113.18	1234.72	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m	n x nm x DTm / 3600		` '	, 1d)	1204.72	٦(٠٠/
(45)m= 167.85 146.8 151.48 132.07 126.72 109.35	101.33 116.28	117.67 137.13	149.69	162.55		
		Total = Sur	n(45) ₁₁₂ =		1618.91	(45)
If instantaneous water heating at point of use (no hot water storage), e	· · ·	· , ,				(10)
(46)m= 25.18 22.02 22.72 19.81 19.01 16.4 Water storage loss:	15.2 17.44	17.65 20.57	22.45	24.38		(46)
Storage volume (litres) including any solar or WWHRS s	storage within sa	me vessel	0			(47)
If community heating and no tank in dwelling, enter 110	litres in (47)					, ,
Otherwise if no stored hot water (this includes instantant	eous combi boile	ers) enter '0' in (47)			
Water storage loss:	/-l \).					(40)
a) If manufacturer's declared loss factor is known (kWh.	/day):		0			(48)
Temperature factor from Table 2b Energy lost from water storage, kWh/year	(48) x (49)	_	0			(49)
b) If manufacturer's declared cylinder loss factor is not	. , , , ,	_	0			(50)
Hot water storage loss factor from Table 2 (kWh/litre/day	y)		0			(51)
If community heating see section 4.3						
Volume factor from Table 2a Temperature factor from Table 2b			0			(52) (53)
	(47) v (54)	v (E2) v (E2) –	0			
Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) X (51)	x (52) x (53) =	0			(54) (55)
Water storage loss calculated for each month	((56)m = (5)	55) × (41)m				(- - /
(56)m= 0 0 0 0 0 0	0 0	0 0	0	0		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (Fig. 1)]						Ť
(57)m= 0 0 0 0 0 0	0 0	0 0	0	0		(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated f	for each month (59)m = (58) ÷	365 × (41)	m					
(modified by factor from Tab	le H5 if there is s	solar water hea	ating and a	cylinde	r thermo	stat)			
(59)m = 0 0 0	0 0	0 0	0	0	0	0	0		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (4	11)m						
(61)m= 50.96 46.03 50.96	49.32 50.96	49.32 50.96	50.96	49.32	50.96	49.32	50.96		(61)
Total heat required for water he	eating calculated	for each mon	th (62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 218.81 192.83 202.44	181.38 177.68	158.67 152.2	9 167.24	166.98	188.09	199	213.51		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quar	tity) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, see /	Appendix (G)	_	_	_		
(63)m= 0 0 0	0 0	0 0	0	0	0	0	0		(63)
FHRS 24.37 21.06 20.83	17.22 15.23	10.6 9.82	11.27	11.4	17.68	20.89	23.87		(63) (G2
Output from water heater									
(64)m= 191.96 169.54 179.14	161.77 159.98	145.68 140	153.5	153.19	167.93	175.72	187.16		_
			Outp	out from wa	ater heate	r (annual) ₁	12	1985.58	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (45	m + (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	
(65)m= 68.55 60.32 63.11	56.24 54.87	48.69 46.43	51.4	51.45	58.34	62.1	66.79		(65)
include (57)m in calculation of	of (65)m only if c	ylinder is in th	edwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	ts								
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 144.62 144.62 144.62	144.62 144.62	144.62 144.6	2 144.62	144.62	144.62	144.62	144.62		(66)
Lighting gains (calculated in Ap	ppendix L, equati	ion L9 or L9a)	also see	Table 5					
(67)m= 26.61 23.63 19.22	14.55 10.88	9.18 9.92	12.9	17.31	21.98	25.66	27.35		(67)
Appliances gains (calculated in	Appendix L, eq	uation L13 or l	_13a), also	see Tal	ble 5	-	-		
(68)m= 296.51 299.59 291.83	275.33 254.49	234.91 221.8	3 218.75	226.5	243.01	263.85	283.43		(68)
Cooking gains (calculated in Ap	ppendix L, equat	ion L15 or L15	ā), also se	ee Table	5				
(69)m= 37.46 37.46 37.46	37.46 37.46	37.46 37.46	37.46	37.46	37.46	37.46	37.46		(69)
Pumps and fans gains (Table 5	5a)		=	-	-	-	-		
(70)m= 3 3 3	3 3	3 3	3	3	3	3	3		(70)
Losses e.g. evaporation (negative	tive values) (Tab	le 5)	•	•	•	•			
(71)m= -115.69 -115.69 -115.69	-115.69 -115.69	-115.69 -115.6	9 -115.69	-115.69	-115.69	-115.69	-115.69		(71)
Water heating gains (Table 5)	•		•	•		•			
(72)m= 92.14 89.76 84.82	78.11 73.76	67.62 62.4	69.09	71.46	78.41	86.25	89.77		(72)
Total internal gains =	•	(66)m + (67	')m + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m= 484.64 482.37 465.26	437.38 408.51	381.1 363.5	4 370.12	384.66	412.78	445.14	469.93		(73)
6. Solar gains:			,						
Solar gains are calculated using solar	r flux from Table 6a	and associated ed	uations to co	onvert to th	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux	_	g_ 	_	FF		Gains	
Table 6d	m²	Table 6a		able 6b		able 6c		(W)	_
North 0.9x 0.77 x	12.3	x 10.63	×	0.4	X	0.7	=	25.38	(74)

North	0.9x	0.77	X	12.3	X	20.32	X	0.4	X	0.7	=	48.5	(74)
North	0.9x	0.77	X	12.3	x	34.53	X	0.4	x [0.7	=	82.41	(74)
North	0.9x	0.77	X	12.3	x	55.46	X	0.4	X	0.7	=	132.38	(74)
North	0.9x	0.77	×	12.3	x	74.72	X	0.4	x	0.7	=	178.32	(74)
North	0.9x	0.77	×	12.3	x	79.99	X	0.4	×	0.7	=	190.9	(74)
North	0.9x	0.77	x	12.3	x	74.68	X	0.4	x	0.7	=	178.23	(74)
North	0.9x	0.77	x	12.3	x	59.25	X	0.4	x	0.7	=	141.4	(74)
North	0.9x	0.77	x	12.3	x	41.52	X	0.4	x [0.7	=	99.09	(74)
North	0.9x	0.77	X	12.3	x	24.19	X	0.4	x	0.7	=	57.73	(74)
North	0.9x	0.77	x	12.3	x	13.12	X	0.4	x	0.7	=	31.31	(74)
North	0.9x	0.77	x	12.3	x	8.86	X	0.4	x [0.7	=	21.16	(74)
East	0.9x	0.77	x	7	x	19.64	X	0.4	x	0.7	=	26.68	(76)
East	0.9x	0.77	x	7	x	38.42	X	0.4	x	0.7	=	52.19	(76)
East	0.9x	0.77	x	7	x	63.27	X	0.4	x	0.7	=	85.94	(76)
East	0.9x	0.77	×	7	x	92.28	X	0.4	x	0.7	=	125.34	(76)
East	0.9x	0.77	x	7	x	113.09	X	0.4	x	0.7	=	153.61	(76)
East	0.9x	0.77	X	7	x	115.77	X	0.4	x	0.7	=	157.25	(76)
East	0.9x	0.77	x	7	X	110.22	Х	0.4	Х	0.7	=	149.71	(76)
East	0.9x	0.77	×	7	х	94.68	х	0.4	x	0.7		128.6	(76)
East	0.9x	0.77	X	7	х	73.59	x	0.4	х	0.7	=	99.95	(76)
East	0.9x	0.77	x	7	x	45.59	x	0.4	x	0.7	=	61.92	(76)
East	0.9x	0.77	x	7	x	24.49	Х	0.4	x	0.7	=	33.26	(76)
East	0.9x	0.77	×	7	x	16.15	X	0.4	х	0.7	=	21.94	(76)
Sout <mark>h</mark>	0.9x	0.77	×	10.3	х	46.75	X	0.4	x	0.7	=	93.44	(78)
South	0.9x	0.77	x	10.3	x	76.57	X	0.4	x	0.7	=	153.03	(78)
South	0.9x	0.77	x	10.3	x	97.53	X	0.4	x	0.7	=	194.93	(78)
South	0.9x	0.77	X	10.3	x	110.23	X	0.4	x [0.7	=	220.32	(78)
South	0.9x	0.77	x	10.3	x	114.87	X	0.4	x [0.7	=	229.58	(78)
South	0.9x	0.77	X	10.3	x	110.55	X	0.4	x	0.7	=	220.94	(78)
South	0.9x	0.77	x	10.3	x	108.01	X	0.4	x	0.7	=	215.87	(78)
South	0.9x	0.77	x	10.3	x	104.89	X	0.4	x [0.7	=	209.64	(78)
South	0.9x	0.77	x	10.3	x	101.89	X	0.4	x	0.7	=	203.63	(78)
South	0.9x	0.77	x	10.3	x	82.59	X	0.4	x	0.7	=	165.06	(78)
South	0.9x	0.77	x	10.3	x	55.42	X	0.4	x	0.7	=	110.76	(78)
South	0.9x	0.77	x	10.3	x	40.4	X	0.4	x	0.7	=	80.74	(78)
`F				for each mon	$\overline{}$		 	n = Sum(74)m	(82)m	,		ı	
` ' L	145.49		63.29	478.03 561.5		69.09 543.81	479	.64 402.67	284.71	175.33	123.83		(83)
Ţ				(84)m = (73) r	<u> </u>	' 1	1	70 707 00	1 007 40	1 000 40	500 77		(0.4)
(84)m=	630.14	736.08 82	28.55	915.41 970.0	3 9	50.19 907.35	849	.76 787.33	697.49	620.46	593.77		(84)
		•		heating seas									
-		_		eriods in the li	_		ble 9	, Th1 (°C)				21	(85)
Utilisat F				iving area, h1	Ť		1 -		T _	1			
L	Jan	Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
Stroma F	SAP 201	2 \/ersion: 1 (5 51 (SAP 9 92) - http:/	/\^\^\	etroma com						Page	5 of 7

(86)m=	1	1	0.99	0.98	0.93	0.8	0.62	0.68	0.9	0.99	1	1		(86)
Mean i	internal	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.76	19.9	20.14	20.45	20.74	20.93	20.99	20.98	20.84	20.47	20.06	19.74		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	 h2 (°C)					
(88)m=	20.02	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.03		(88)
Utilisat	tion fac	tor for a	ains for	rest of d	wellina.	h2.m (se	e Table	9a)						
(89)m=	1	1	0.99	0.97	0.9	0.71	0.5	0.56	0.85	0.98	1	1		(89)
Mean i	internal	temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.35	18.57	18.91	19.37	19.77	20.01	20.05	20.05	19.92	19.4	18.81	18.33		(90)
_									f	LA = Livin	g area ÷ (4	4) =	0.23	(91)
Mean i	internal	temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) x T2			'		
(92)m=	18.68	18.88	19.19	19.62	20	20.22	20.27	20.27	20.13	19.65	19.1	18.66		(92)
Apply a	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate	Į.			
(93)m=	18.68	18.88	19.19	19.62	20	20.22	20.27	20.27	20.13	19.65	19.1	18.66		(93)
8. Spa	ce heat	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
tne util		Feb	Ĭ	using Ta		lup	lul	Aug	Son	Oct	Nov	Doo		
_ L Itilisat	Jan tion fac	$\overline{}$	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	NOV	Dec		
(94)m=	1	1	0.99	0.97	0.9	0.73	0.53	0.59	0.86	0.98	1	1		(94)
L	gains,	hmGm	W = (94)	4)m x (84	1)m									
	629.18	733.39	820.34	885.97	871.09	693.14	480.03	499.15	673.38	682.78	618.36	593.11		(95)
Monthl	ly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			r	· ·		Lm , W =	=[(39)m :	x [(93)m	– (96)m]	ı			
(97)m=					1119.25	747.03	487.61	512.14	806.34	1221.42	<u> </u>	1974.65		(97)
		· ·	i -			Wh/mont	h = 0.02	24 x [(97 ₎)m – (95 0	<u> </u>		4007.00		
(98)m=	1010.42	801.2	686.92	406.91	184.64	0	U			400.74	727.27	1027.86	5045.00	(98)
					,			rota	l per year	(kvvn/year) = Sum(9	8)15,912 =	5245.96	
Space	heating	g require	ement in	kWh/m²	/year								40.67	(99)
			nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	heatin	_	ot from o	ooondor	/ounnio	montory	ovotom					Ī		(201)
				econdar	• • •	mentary	•	(202) 4	(204)			ļ	0	(201)
	•			nain syst	. ,			(202) = 1		(000)1			1	(202)
			•	main sys				(204) = (2	02) x [1 – ((203)] =			1	(204)
	•	-		ing syste									93	(206)
Efficier	ncy of s	econda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	/ear
· -	i		<u>`</u>	alculate								<u> </u>		
L	1010.42		686.92	406.91	184.64	0	0	0	0	400.74	727.27	1027.86		
· · · -	i			00 ÷ (20				ı			1			(211)
Ľ	1086.47	861.51	738.62	437.53	198.53	0	0	0 Tata	0	430.91	782.01	1105.23		
								rota	I (kWh/yea	u) =3UM(2	- 1 1) _{15,1012}	=	5640.82	(211)

Space heating fuel (secondary), kWh/month							
$= \{[(98) \text{m x } (201)]\} \times 100 \div (208)$							
(215)m= 0 0 0 0 0	0 0	0	0 0	0	0		
		Total (kW	/h/year) =Sum(215) _{15,101}	2=	0	(215)
Water heating							
Output from water heater (calculated above) 191.96 169.54 179.14 161.77 159.98 1	45.68 140	153.5 153	3.19 167.93	175.72	187.16		
Efficiency of water heater						79.9	(216)
(217)m= 88.22 88.06 87.71 86.88 85.01	79.9 79.9	79.9 79	9.9 86.76	87.84	88.28		(217)
Fuel for water heating, kWh/month	•		•	•	•	-	
(219) m = (64) m x $100 \div (217)$ m (219)m = 217.6 192.54 204.25 186.21 188.19 1	82.33 175.22	192.11 19 ⁻	1.72 193.56	200.04	212.01		
217.0 102.04 204.20 100.21 100.10 1	02.00 170.22		um(219a) ₁₁₂ =	200.04	212.01	2335.78	(219)
Annual totals				Wh/yea	r	kWh/year	J` ''
Space heating fuel used, main system 1				-		5640.82	
Water heating fuel used						2335.78]
Electricity for pumps, fans and electric keep-hot					'		_
mechanical ventilation - balanced, extract or pos	itive input fron	n outside			230.17		(230a)
central heating pump:					30		(230c)
boi <mark>ler wi</mark> th a fan-assisted flue					45		(230e)
Total electricity for the above, kWh/year		sum of (2	230a)(230g) =			305.17	(231)
Electricity for lighting						469.94	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				8 <mark>751.7</mark>	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Energy		Emiss	ion fac	tor	Emissions	
	kWh/year		kg CO			kg CO2/yea	ır
Space heating (main system 1)	(211) x		0.2	16	=	1218.42	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	504.53	(264)
Space and water heating	(261) + (262)	+ (263) + (264)	=			1722.94	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	158.38	(267)
Electricity for lighting	(232) x		0.5	19	=	243.9	(268)
Total CO2, kg/year		\$	sum of (265)(271) =		2125.22	(272)
Dwelling CO2 Emission Rate		((272) ÷ (4) =			16.47	(273)

El rating (section 14)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: House Sample 2 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x (2a) = (3a) 129 3 387 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)129 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =387 (5) total main secondary other m³ per hour heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)4 40 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) 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) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (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

djusted infiltr	ation rate	e (allowi	ing for sh	nelter an	nd wind s	peed) =	(21a) x	(22a)m	•	1	T		
0.38 Calculate effec	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35		
If mechanica		•	iale ioi l	пе аррп	cable ca	3E						0	(2
If exhaust air he	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24t	m = (22)	2b)m + (23b)		•	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•					.5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n									0.5]	•	•		
4d)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				•	
5)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
3. Heat losse	s and he	eat loss	paramet	er:								_	
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	2K	(W/I	K)	kJ/m²-	<	kJ/K
oors					2.4	Х	1	=	2.4				(2
/indows Type	1				12.3	x1.	/[1/(1.4)+	0.04] =	16.31				(2
/indows Type	2				10.3	x1.	/[1/(1.4)+	0.04] =	13.66				(2
indows Type	3				7	х1.	/[1/(1.4)+	0.04] =	9.28				(2
oor					46	X	0.13	=	5.98	\Box [(2
/alls Type1	42		12.3		29.7	Х	0.18	=	5.35				(2
/alls Type2	44		12.7		31.3	X	0.18	=	5.63				(2
/alls Type3	91		7		84	x	0.18	=	15.12	₹ i		$\neg \ \ $	(2
oof	46		0		46	x	0.13	-	5.98			7 6	(:
otal area of e	lements	, m²			269								(:
or windows and						ated using	formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	3.2	
include the area				ls and par	titions		(0.0) (0.0)	(00)					
abric heat los		•	U)				(26)(30)	, , ,	4	_, ,,		79.7	(:
eat capacity	,			T E A \ :	1 1/ 01/			,	(30) + (32	, , ,	(32e) =	5894	
hermal mass	•	`		,					itive Value		-bl- 4£	250	(;
or design assess In be used inste				construct	ion are no	t known pr	ecisely the	e inaicative	e values of	TIVIP IN T	able 11		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						13.45	j (:
details of therma		are not kn	nown (36) =	= 0.05 x (3	31)								
otal fabric he	at loss							(33) +	(36) =			93.15	(:
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

											l	l	l	(0.0)
(38)m=	73.22	72.86	72.5	70.83	70.51	69.05	69.05	68.78	69.62	70.51	71.15	71.81		(38)
Heat tr	ansfer o	coefficie		·	·	·	·	·	(39)m	= (37) + (38)m	1	1	
(39)m=	166.37	166.01	165.65	163.98	163.66	162.21	162.21	161.94	162.77	163.66	164.3	164.96		¬
Heat lo	ss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) ₁ . (4)	12 /12=	163.98	(39)
(40)m=	1.29	1.29	1.28	1.27	1.27	1.26	1.26	1.26	1.26	1.27	1.27	1.28		_
Numbe	or of do	o in mo	oth /Tob	lo 1o\					,	Average =	Sum(40) ₁	12 /12=	1.27	(40)
Numbe	Jan	Feb	nth (Tab Mar		May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	Apr 30	May 31	30	31	Aug 31	30	31	30	31		(41)
(+1)111=	31	20							30	- 51		J 31		(,
4 10/												1.20/1./		
4. Wa	iter heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
	ed occu											.89		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.	.9)			
		•	ater usag	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		10:	2.89		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o			I	(- /
not more	e that 125	litres per	person per	r day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea	ach month	Vd,m = ta		able 1c x							
(44)m=	113.18	109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07	113.18		¬
Energy (content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1234.72	(44)
(45)m=	167.85	146.8	151.48	132.07	126.72	109.35	101.33	116.28	117.67	137.13	149.69	162.55		
# : (- · ·						()	2 12 12 2 2 2	h (40		Γotal = Su	m(45) ₁₁₂ =	=	1618.91	(45)
			ng at point I	,			1		, ,		i	i	I	(15)
(46)m= Water	25.18 storage	22.02	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
	_		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
_		, ,	ind no ta	•			•						I	()
	•	•	hot wate		•			` '	ers) ente	er '0' in (47)			
	storage												-	
•			eclared I		or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
			storage	-				(48) x (49)) =			0		(50)
•			eclared of factor fr	-								0		(51)
		•	ee secti		0 2 (,	•97					0	I	(01)
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	55)									0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)r	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)

Output from water heater (64)ms								
(69)m	Primary circuit loss (annual) fro	om Table 3				0]	(58)
Combi Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost Cost	Primary circuit loss calculated	for each month (59)m = (58) ÷ 3	865 × (41)m				
Combi loss calculated for each month (61)m = (60) + 365 x (41)m (61)m = 50.96	(modified by factor from Tab	le H5 if there is s	solar water heat	ting and a cylinde	er thermostat)			
(61)ms	(59)m = 0 0 0	0 0	0 0	0 0	0 0	0		(59)
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 218.81 192.83 202.44 181.38 176.01 155.02 148.52 166.57 166.98 188.09 199 213.51 (62) Solar PHW input calculated using Appendix G or Appendix H (regative 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	Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (4	1)m				
Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column C	(61)m= 50.96 46.03 50.96	49.32 49.29	45.67 47.19	49.29 49.32	50.96 49.32	50.96		(61)
Solar DHW input calculated using Appendix G or Appendix H (regative quantity) (enter ® if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m=0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Total heat required for water he	eating calculated	for each mont	h (62)m = 0.85 ×	(45)m + (46)m	+ (57)m +	(59)m + (61)m	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) ((63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(62)m= 218.81 192.83 202.44	181.38 176.01	155.02 148.52	165.57 166.98	188.09 199	213.51		(62)
Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column C	Solar DHW input calculated using App	endix G or Appendix	H (negative quant	ity) (enter '0' if no sol	ar contribution to w	ater heating)	•	
Cooking gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68) me 26.51 29.59 29.183 27.53 25.44 91.50 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21.15.69 21	(add additional lines if FGHRS	and/or WWHRS	applies, see A	ppendix G)			_	
Output from water heater (64)ms	(63)m= 0 0 0	0 0	0 0	0 0	0 0	0		(63)
Column	FHRS 0 0 0	0 0	0 0	0 0	0 0	0		(63) (G2
Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Court Cour	Output from water heater							
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m = 68.55	(64)m= 218.81 192.83 202.44	181.38 176.01	155.02 148.52	165.57 166.98	188.09 199	213.51		_
(65) m= 68.55 60.32 63.11 56.24 54.46 47.78 45.49 50.98 51.45 58.34 62.1 66.79 (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= 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.				Output from v	vater heater (annua	ll) ₁₁₂	2208.15	(64)
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 = 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 1	Heat gains from water heating,	, kWh/month 0.25	5 ´ [0.85 × (45)r	m + (61)m] + 0.8	x [(46)m + (57)	m + (59)m	1	
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(65)m= 68.55 60.32 63.11	56.24 54.46	47.78 45.49	50.98 51.45	58.34 62.1	66.79		(65)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	include (57)m in calculation	of (65)m only if c	ylinder is in the	dwelling or hot	wate <mark>r is from co</mark>	mmunity h	eating	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	5. Internal gains (see Table 5	5 and 5a):						
(66)m= 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 26.43 23.48 19.09 14.46 10.81 9.12 9.86 12.81 17.2 21.84 25.49 27.17 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.4	Metabolic gains (Table 5), Wat	rts						
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 26.43 23.48 19.09 14.46 10.81 9.12 9.86 12.81 17.2 21.84 25.49 27.17 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.			Jun <mark>Jul</mark>	Aug Sep	Oct Nov	/ Dec		
(67)m= 26.43 23.48 19.09 14.46 10.81 9.12 9.86 12.81 17.2 21.84 25.49 27.17 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46	(66)m= 144.62 144.62 144.62	144.62 144.62	144.62 144.62	144.62 144.62	144.62 144.6	2 144.62		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Lighting gains (calculated in Ar	opendix L, equati	ion L9 or L9a),	also see T <mark>able 5</mark>				
(68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37	(67)m= 26.43 23.48 19.09	14.46 10.81	9.12 9.86	12.81 17.2	21.84 25.49	27.17		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 3	Appliances gains (calculated in	n Appendix L, eq	uation L13 or L	13a), also see Ta	able 5			
(69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(68)m= 296.51 299.59 291.83	275.33 254.49	234.91 221.83	218.75 226.5	243.01 263.8	5 283.43		(68)
Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Cooking gains (calculated in A	ppendix L, equat	ion L15 or L15	a), also see Tabl	e 5			
(70) m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(69)m= 37.46 37.46 37.46	37.46 37.46	37.46 37.46	37.46 37.46	37.46 37.46	37.46		(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -1	Pumps and fans gains (Table 5	5a)						
(71)m=	(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)
Water heating gains (Table 5) (72)m= 92.14 89.76 84.82 78.11 73.19 66.36 61.14 68.53 71.46 78.41 86.25 89.77 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 484.47 482.21 465.14 437.28 407.88 379.77 362.21 369.47 384.55 412.64 444.97 469.75 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d Table 6c (W)	Losses e.g. evaporation (nega-	tive values) (Tab	le 5)					
(72)m= 92.14 89.76 84.82 78.11 73.19 66.36 61.14 68.53 71.46 78.41 86.25 89.77 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 484.47 482.21 465.14 437.28 407.88 379.77 362.21 369.47 384.55 412.64 444.97 469.75 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d Table 6d Table 6c (W)	(71)m= -115.69 -115.69 -115.69	-115.69 -115.69	-115.69 -115.69	-115.69 -115.69	-115.69 -115.6	9 -115.69		(71)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m=	Water heating gains (Table 5)							
(73)m= 484.47 482.21 465.14 437.28 407.88 379.77 362.21 369.47 384.55 412.64 444.97 469.75 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d Table 6d Table 6c (W)	(72)m= 92.14 89.76 84.82	78.11 73.19	66.36 61.14	68.53 71.46	78.41 86.25	89.77		(72)
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)	Total internal gains =		(66)m + (67)	m + (68)m + (69)m +	· (70)m + (71)m + (7	72)m		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)	(73)m= 484.47 482.21 465.14	437.28 407.88	379.77 362.21	369.47 384.55	412.64 444.9	7 469.75		(73)
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)	6. Solar gains:			•		·		
Table 6d m ² Table 6a Table 6b Table 6c (W)	Solar gains are calculated using sola	r flux from Table 6a	and associated equ	ations to convert to		tation.		
North 0.9x 0.77 x 12.3 x 10.63 x 0.63 x 0.7 = 39.97 (74)						C		
1.2.0	North 0.9x 0.77 x	12.3	x 10.63	x 0.63	x 0.7	=	39.97	(74)

	_					,					_				
North	0.9x	0.77		X	12.3	X	2	0.32	X	0.63	X	0.7	=	76.39	(74)
North	0.9x	0.77		X	12.3	X	3	4.53	X	0.63	X	0.7	=	129.8	(74)
North	0.9x	0.77		X	12.3	X	5	5.46	X	0.63	X	0.7	=	208.49	(74)
North	0.9x	0.77		X	12.3	X	7	4.72	X	0.63	X	0.7	=	280.86	(74)
North	0.9x	0.77		X	12.3	X	7	9.99	X	0.63	X	0.7	=	300.67	(74)
North	0.9x	0.77		X	12.3	X	7	4.68	x	0.63	X	0.7	=	280.71	(74)
North	0.9x	0.77		X	12.3	X	5	9.25	X	0.63	X	0.7	=	222.71	(74)
North	0.9x	0.77		X	12.3	X	4	1.52	X	0.63	X	0.7	=	156.06	(74)
North	0.9x	0.77		X	12.3	X	2	4.19	X	0.63	X	0.7	=	90.93	(74)
North	0.9x	0.77		X	12.3	X	1	3.12	X	0.63	X	0.7	=	49.31	(74)
North	0.9x	0.77		X	12.3	X	8	3.86	X	0.63	X	0.7	=	33.32	(74)
East	0.9x	0.77		X	7	X	1	9.64	X	0.63	X	0.7	=	42.02	(76)
East	0.9x	0.77		X	7	x	3	8.42	x	0.63	x	0.7	=	82.19	(76)
East	0.9x	0.77		X	7	X	6	3.27	x	0.63	X	0.7	=	135.36	(76)
East	0.9x	0.77		X	7	x	9	2.28	x	0.63	X	0.7	=	197.41	(76)
East	0.9x	0.77		X	7	x	1	13.09	x	0.63	X	0.7	=	241.94	(76)
East	0.9x	0.77		X	7	X	1	15.77	x	0.63	X	0.7	=	247.67	(76)
East	0.9x	0.77		X	7	X	1	10.22	Х	0.63	X	0.7	=	235.79	(76)
East	0.9x	0.77		x	7	х	9	4.68	x	0.63	x	0.7	=	202.54	(76)
East	0.9x	0.77		x	7	х	7	3.59	x	0.63	x	0.7	=	157.43	(76)
East	0.9x	0.77		x	7	x	4	5.59	x	0.63	x	0.7	=	97.53	(76)
East	0.9x	0.77		X	7	x	2	4.49	Х	0.63	x	0.7	=	52.39	(76)
East	0.9x	0.77		x	7	x	1	6.15	X	0.63	x	0.7	=	34.55	(76)
South	0.9x	0.77		x	10.3	x	4	6.75	X	0.63	x	0.7	=	147.17	(78)
South	0.9x	0.77		X	10.3	x	7	6.57	x	0.63	x	0.7	=	241.02	(78)
South	0.9x	0.77		X	10.3	X	9	7.53	x	0.63	x	0.7	=	307.02	(78)
South	0.9x	0.77		X	10.3	X	1	10.23	x	0.63	x	0.7	=	347	(78)
South	0.9x	0.77		X	10.3	X	1	14.87	x	0.63	X	0.7	=	361.59	(78)
South	0.9x	0.77		X	10.3	X	1	10.55	x	0.63	x	0.7	=	347.98	(78)
South	0.9x	0.77		X	10.3	x	10	08.01	x	0.63	x	0.7	=	340	(78)
South	0.9x	0.77		X	10.3	X	10	04.89	x	0.63	X	0.7	=	330.19	(78)
South	0.9x	0.77		X	10.3	x	10	01.89	x	0.63	X	0.7	=	320.72	(78)
South	0.9x	0.77		X	10.3	x	8	2.59	x	0.63	X	0.7	=	259.96	(78)
South	0.9x	0.77		X	10.3	x	5	5.42	x	0.63	×	0.7	=	174.44	(78)
South	0.9x	0.77		X	10.3	x	4	40.4	x	0.63	x	0.7	=	127.17	(78)
						_									
Solar g	ains in	watts, ca	alculate	ed	for each mon	th			(83)m	= Sum(74)m .	(82)m			_	
` ′ L	229.15	399.6	572.18		752.9 884.3		896.32	856.5	755	.44 634.21	448.42	2 276.14	195.04		(83)
Ī				_	(84)m = (73) n		` '			-	ı	1	ı	٦	45.0
(84)m=	713.62	881.81	1037.3	2	1190.19 1292.2	27 /	1276.09	1218.71	1124	1.91 1018.76	861.06	721.11	664.79		(84)
7. Mea	an interi	nal temp	eratur	e (heating seaso	on)									
Tempe	erature	during h	eating	ре	eriods in the li	ving	g area f	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains fo	r li	ving area, h1,	m (see Ta	ble 9a)						7	
	Jan	Feb	Mai	.	Apr Ma	y	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
04	0 4 D 004	0 \	4055		2AD 0 02\ http://									-	E of 7

(86)m=	1	1	0.99	0.96	0.88	0.73	0.56	0.63	0.86	0.98	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.53	19.73	20.02	20.4	20.73	20.92	20.98	20.97	20.82	20.39	19.89	19.5		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.85	19.85	19.85	19.86	19.87	19.87	19.87	19.88	19.87	19.87	19.86	19.86		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m=	1	0.99	0.98	0.94	0.84	0.63	0.43	0.49	0.79	0.97	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	e 9c)	-	-		
(90)m=	17.9	18.18	18.61	19.16	19.6	19.82	19.87	19.86	19.73	19.15	18.42	17.86		(90)
		-	-	-	-	-	-	-	f	LA = Livin	g area ÷ (4) =	0.23	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	_A) × T2					
(92)m=	18.28	18.54	18.94	19.45	19.86	20.08	20.13	20.12	19.98	19.44	18.76	18.24		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate			•	
(93)m=	18.28	18.54	18.94	19.45	19.86	20.08	20.13	20.12	19.98	19.44	18.76	18.24		(93)
			uirement							. —				
			ernal ter or gains			ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm									!	,	
(94)m=	1	0.99	0.98	0.94	0.84	0.65	0.46	0.52	0.8	0.96	0.99	1		(94)
Us <mark>ef</mark> u	ı <mark>l g</mark> ains,	hmGm	, W = (9	4)m x (8		•								
(95)m=	711.43	874.73		1115.71	1080.75	831.92	563.17	587.23	812.18	828.07	716.24	663.31		(95)
			rnal tem	_			100							(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	(06)m	10.6	7.1	4.2		(96)
	2325.79		r	· ·	1335.76	888.83	572.09	602.68	- (96)m 957.68	1446.72	1916.3	2316.08		(97)
` '			<u> </u>	ļ	ļ	<u> </u>	<u> </u>	<u> </u>)m – (95			2010.00		(51)
	1201.08	<u> </u>	778.05	442.19	189.73	0	0	0	0	460.28	864.05	1229.66		
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	6098.9	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								47.28	(99)
9a. En	erav red	uiremer	nts – Indi	ividual h	eating s	vstems i	ncludina	micro-C	CHP)					
	e heatir					, 0101110 1			, , , , , , , , , , , , , , , , , , ,					
•		_	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/s	— year
Space			ement (c			<u> </u>							_	
	1201.08	933.86	778.05	442.19	189.73	0	0	0	0	460.28	864.05	1229.66		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20)6)					_				(211)
	1285.96	999.85	833.02	473.44	203.13	0	0	0	0	492.8	925.1	1316.56		
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	6529.87	(211)
												'		_

Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0	0 0	0	0	0		
		Total (kWh	/year) =Sum(215) _{15,101}		0	(215)
Water heating							_
Output from water heater (calculated above) 218.81 192.83 202.44 181.38 176.01 1	55.02 148.52	165.57 166.	98 188.09	199	213.51		
Efficiency of water heater	140.02	103.37 100.	90 100.09	199	213.31	80.3	(216)
· · · · · · · · · · · · · · · · · · ·	80.3 80.3	80.3 80.	3 87.22	88.32	88.75	00.0	` ´ (217)
Fuel for water heating, kWh/month					1	I	
(219) m = (64) m x $100 \div (217)$ m (219)m= 246.73 217.9 229.76 207.99 206.49 1	93.05 184.96	206.18 207.	95 215.65	225.32	240.58		
(2-0)			m(219a) ₁₁₂ =	1	1	2582.54	(219)
Annual totals			k	Wh/yea	r	kWh/yea	
Space heating fuel used, main system 1						6529.87	
Water heating fuel used						2582.54	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(2300
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year		sum of (23	0a)(2 <mark>3</mark> 0g) =	=		75	(231)
Electricity for lighting						466.84	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)	(237b) =				9654.25	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Energy kWh/year			ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x		0.2	16	=	1410.45	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	557.83	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =	:			1968.28	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	38.93	(267)
Electricity for lighting	(232) x		0.5	19	=	242.29	(268)
Total CO2, kg/year		SU	m of (265)(271) =		2249.49	(272)
							¬ .

TER =

(273)

17.44

APPENDIX 7 – GREEN TER, DER AND SAP INPUTS **A7**

Property Details: Sample 1 (Mid)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2019

Floor Location: Floor area:

Storey height:

Floor 0 66.25 m² 3 m

Living area: 27.2 m² (fraction 0.411)

Front of dwelling faces: Unspecified

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	Frame:
DOOR	Manufacturer	Solid			W <mark>ood</mark>
Balcon	y Manufacturer	Windows	low-E, $En = 0.05$, soft co	oat No	
N	Manufacturer	Windows	low-E, En = 0.05 , soft co	oat No	
E	Manufacturer	Windows	low-E, En = 0.05 , soft co	oat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
Balcony		0.7	0.4	1	4.8	1
N		0.7	0.4	1	5.44	1
F		0.7	0.4	1	1 1/1	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
Balcony		N	North	0	0
N		N	North	0	0
E		Е	East	0	0

Overshading: Heavy

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>:S</u>						
N	10.24	10.24	0	0.15	0	False	N/A
E	1.44	1.44	0	0.15	0	False	N/A
INT	13.2	2.4	10.8	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901

Fuel :heat from electric heat pump

No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	FSAP 201	2		Strom Softwa	a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty	Address	: Sample	e 1 (Mid))			
Address :											
1. Overall dwelling dime	ensions:			A ===	a (res 2 \		Av. Ha	: a.b.4/\		Values a/m²	21
Ground floor					a(m²) 66.25	(1a) x		ight(m)	(2a) =	Volume(m) 198.75	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	ገ) 6	6.25	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	198.75	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdar neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ır
Number of open flues	0	╡ + ト	0	╡ + ⊨	0	_ 	0	x	20 =	0	(6b)
Number of intermittent fa		L		J L		J	0		10 =	0	(7a)
Number of passive vents						Ļ			10 =		╡`′
·						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has t			ed, procee	ed to (17),	otherwise (continue fr	om (9) to ((16)			_
Number of storeys in t Additional infiltration	he dwelling	(ns)						[(0)	-1]x0.1 =	0	(9)
Structural infiltration: 0	25 for steel	or timber	frame o	: 0.35 fo	r masoni	ry constr	uction	[(9)]	-1]XU.1 =	0	(10)
if both types of wall are p						•					(/
deducting areas of openi	• /		۰ ۱ ۱	4 (I\						
If suspended wooden If no draught lobby, er		•	iea) or u	.1 (seale	ea), eise	enter U				0	(12)
Percentage of window			tripped							0	(13)
Window infiltration	o and accio	draagiii o	прроц		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expres	sed in cub	oic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, th	en (18) = [(1	7) ÷ 20]+(8), otherw	ise (18) =	(16)				0.15	(18)
Air permeability value applie		ation test ha	s been doi	ne or a de	gree air pe	rmeability	is being us	sed			_
Number of sides shelters Shelter factor	ed				(20) = 1 -	[0.075 x (1	19)1 =			2	(19)
Infiltration rate incorpora	tina shelter t	actor			(21) = (18	`	. •/]			0.85	(20)
Infiltration rate modified	•		4		(= -)	, (=0)				0.13	(21)
Jan Feb	Mar Api		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp			1	1	1	1 222	1	1		J	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.				•	•			•	•	1	
Wind Factor $(22a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m = (2a)m =$			l	I		l .				1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		•	rate for t	he appli	cable ca	se		l	l				
If mechanica			l' N. (0	al.) (aa	\ - /			. (00)	\ (00 \			0.5	(238
If exhaust air h) = (23a)			0.5	(23k
If balanced with		•	-	_								79.05	(230
a) If balance	ı —					- ` 	- ^ ` 	ŕ	 		- `) ÷ 100] 1	(0.4-
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24a
b) If balance	i						 	í `	r ´ `	- 	Ι ,	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24k
c) If whole h				•					5 × (23b	o)		-	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and he	eat loss	paramete	er:							_	_	
ELEMENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1.4	=	3.36				(26)
Win <mark>dows</mark> Type	e 1				4.8	X	1/[1/(1)+	0.04] =	4.62	П			(27)
Windows Type	2				5.44	x	1/[1/(1)+	0.04] =	5.23	Ħ			(27)
Windows Type	3				1.44	×	1/[1/(1)+	0.04] =	1.38	5			(27)
Walls Type1	10.2	24	10.24	4	0	x	0.15	=	0	= [(29)
Walls Type2	1.4	4	1.44		0	x	0.15	=	0	Ħ i		7 F	(29)
Walls Type3	13.:	2	2.4		10.8	X	0.15		1.62			-	(29)
Walls Type4	2.4		0		2.4	x	0.35	-	0.84	=		= =	(29)
Total area of e	lements	 , m²			27.28	<u> </u>							(31)
* for windows and			effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	` '
** include the area	as on both	sides of in	nternal wal	ls and par	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				17.05	(33)
Heat capacity		,						((28).	(30) + (32	2) + (32a).	(32e) =	184.8	(34)
Thermal mass	•	`		,					tive Value			250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge					-	<						4.09	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			21.14	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 17.53	17.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7]	(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m		_	
39)m= 38.67	38.46	38.25	37.21	37	35.95	35.95	35.75	36.37	37	37.42	37.84]	
Stroma FSAP 201	2 Version	1.0.5.51 ((SAP 9.92)	- http://wv	ww.stroma	.com			Average =	: Sum(39) ₁	12 /12=	37.16	age 2 of 349)

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.58	0.58	0.58	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		
				ı			ı		Average =	Sum(40) ₁	12 /12=	0.56	(40)
Number of day	1	nth (Tab	le 1a)		1	1		1					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		15		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		5.3		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
		•				•				ım(44) ₁₁₂ =		1023.65	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		_
If instantaneous w	vater heati	ng at point	of use (no	n hot water	storage)	enter () in	hoxes (46		Total = Su	ım(45) ₁₁₂ =		1342.17	(45)
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage		10.04	10.42	13.70	13.0	12.0	14.40	14.03	17.03	10.01	20.21		(40)
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		الممسمام	ft-	مماد الم	/1.\^/1	- /-l-: ·\·							(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	_		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'FF\ (44)		1.	.03		(55)
Water storage					Ι			(55) × (41)					(==)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	S. 11	(56)
If cylinder contains									ını where (,HII) IS IIO		хп	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	•	,									0		(58)
Primary circuit				,	•		, ,		(I.	-1-1			
(modified by			ı —		ı —			<u> </u>	1	- 	00.00		(EO)
(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 calculated for each month (61)m = (60) ÷ 365 × (41)m												
(61)m= 0 0 0	<u> </u>	0 0 0	0 0	0 0	(61)							
Total heat required for water he	eating calculated for	each month (62)m	$= 0.85 \times (45) \text{m} +$	(46)m + (57)m +	· (59)m + (61)m							
(62)m= 194.43 171.63 180.87	162.99 160.34 14	4.15 139.29 151.6	3 151.05 168.96	177.59 190.04	(62)							
Solar DHW input calculated using App	endix G or Appendix H (r	negative quantity) (enter	'0' if no solar contribu	tion to water heating)	<u>.</u> I							
(add additional lines if FGHRS	and/or WWHRS ap	plies, see Appendix	(G)		_							
(63)m= 0 0 0	0 0	0 0 0	0 0	0 0	(63)							
FHRS 17.95 15.96 16.41	14.51 13.96 12	2.12 11.22 12.87	13.02 15.02	16.24 17.46	(63) (G2)							
Output from water heater					_							
(64)m= 173.8 153.25 161.77	145.88 143.69 12	9.44 125.38 136.1	3 135.43 151.27	158.76 169.9								
		0	utput from water heate	er (annual) ₁₁₂	1784.71 (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	<u>1</u>]							
(65)m= 90.49 80.41 85.98	79.2 79.15 72	2.94 72.15 76.27	75.23 82.02	84.06 89.03	(65)							
include (57)m in calculation of	of (65)m only if cylin	der is in the dwellin	g or hot water is f	rom community h	neating							
5. Internal gains (see Table 5	and 5a):											
Metabolic gains (Table 5), Wat	ts				_							
Jan Feb Mar	Apr May	Jun Jul Aug	Sep Oct	Nov Dec								
(66)m= 107.59 107.59 107.59	107.59 107.59 10	7.59 107.59 107.5	9 107.59 107.59	107.59 107.59	(66)							
Ligh <mark>ting g</mark> ains (calcu <mark>lated</mark> in Ap	ppendix L, equation	L9 or L9a), also se	e Table 5									
(67)m= 17.65 15.68 12.75	9.65 7.22 6	.09 6.58 8.56	11.48 14.58	17.02 18.14	(67)							
Appliances gains (calculated in	Appendix L, equati	on L13 <mark>or L13a), al</mark>	so see Table 5									
(68)m= 188.39 190.35 185.42	174.93 161.69 14	9.25 140.94 138.9	3 143.91 154.4	167.64 180.08	(68)							
Cooking gains (calculated in A	ppendix L, equation	L15 or L15a), also	see Table 5		•							
(69)m= 33.76 33.76 33.76	33.76 33.76 33	3.76 33.76 33.76	33.76 33.76	33.76 33.76	(69)							
Pumps and fans gains (Table 5	5a)	•	•	•	•							
(70)m= 0 0 0	0 0	0 0 0	0 0	0 0	(70)							
Losses e.g. evaporation (negat	tive values) (Table 5	5)	•	•	•							
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07 -8	6.07 -86.07 -86.0	7 -86.07 -86.07	-86.07 -86.07	(71)							
Water heating gains (Table 5)			•	•	•							
(72)m= 121.63 119.66 115.56	110 106.39 10	01.3 96.98 102.5	2 104.49 110.25	116.75 119.66	(72)							
Total internal gains =		(66)m + (67)m + (68)r	n + (69)m + (70)m + (7	71)m + (72)m	•							
(73)m= 382.95 380.96 369.01	349.86 330.58 31	1.92 299.78 305.3	4 315.16 334.5	356.68 373.16	(73)							
6. Solar gains:												
Solar gains are calculated using solar	r flux from Table 6a and a	associated equations to	convert to the applica	ble orientation.								
Orientation: Access Factor	Area	Flux	g_ T.L. O	FF	Gains							
Table 6d	m²	Table 6a	Table 6b T	able 6c	(W)							
North 0.9x 0.77 x	4.8 ×	10.63 ×	0.4 ×	0.7 =	9.9 (74)							
North 0.9x 0.77 x	5.44 ×	10.63 ×	0.4 ×	0.7 =	11.22 (74)							
North 0.9x 0.77 x	4.8 ×	20.32 ×	0.4 ×	0.7 =	18.93 (74)							
North 0.9x 0.77 x	5.44 ×	20.32 ×	0.4 ×	0.7 =	21.45 (74)							

N I o mtlo			_						1			- r		_		
North	0.9x	0.77	X	4.8	8	X	3,	4.53	X		0.4] × [0.7	_ =	32.16	(74)
North	0.9x	0.77	X	5.4	14	X	34	4.53	X		0.4	_ x [0.7	_ =	36.45	(74)
North	0.9x	0.77	X	4.8	8	X	5	5.46	X		0.4	_ x [0.7	=	51.66	(74)
North	0.9x	0.77	X	5.4	4	X	5	5.46	X		0.4	×	0.7	=	58.55	(74)
North	0.9x	0.77	X	4.8	8	X	7.	4.72	X		0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	X	5.4	4	X	7-	4.72	X		0.4	x	0.7	=	78.87	(74)
North	0.9x	0.77	X	4.8	8	X	79	9.99	X		0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	5.4	l4	X	79	9.99	X		0.4	x [0.7	=	84.43	(74)
North	0.9x	0.77	X	4.8	8	x	7-	4.68	X		0.4	x [0.7	=	69.55	(74)
North	0.9x	0.77	X	5.4	4	x	7-	4.68	X		0.4	x [0.7	=	78.83	(74)
North	0.9x	0.77	X	4.8	8	x	5	9.25	x		0.4	x [0.7	=	55.18	(74)
North	0.9x	0.77	X	5.4	l4	x	59	9.25	X		0.4	x [0.7	=	62.54	(74)
North	0.9x	0.77	x	4.8	8	x	4	1.52	x		0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	x	5.4	l4	x	4	1.52	X		0.4	x	0.7	<u> </u>	43.82	(74)
North	0.9x	0.77	x	4.8	8	x	24	4.19	x		0.4	ĪxĪ	0.7	=	22.53	(74)
North	0.9x	0.77	x	5.4	ļ4	x	24	4.19	x		0.4	i x	0.7		25.53	(74)
North	0.9x	0.77	X	4.8	8	x	1;	3.12	x		0.4	×	0.7		12.22	(74)
North	0.9x	0.77	x	5.4	14	X	1;	3.12	Х		0.4	х	0.7		13.85	(74)
North	0.9x	0.77	X	4.8	В	х	8	5.86	х		0.4	×	0.7	= -	8.26	(74)
North	0.9x	0.77	X	5.4	l4	х	8	3.86	x		0.4	x	0.7	=	9.36	(74)
East	0.9x	0.77	X	1.4	14	X	19	9.64	X		0.4	x	0.7	_	5.49	(76)
East	0.9x	0.77	Ħ x	1.4	$\overline{}$	X		8.42	X		0.4	X	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.4	\rightarrow	X		3.27	X		0.4	i X	0.7	= =	17.68	(76)
East	0.9x	0.77	×	1.4		X		2.28	X		0.4		0.7	= =	25.78	(76)
East	0.9x	0.77	x	1.4		X		3.09	X		0.4] _x [0.7	╡ .	31.6	(76)
East	0.9x	0.77	×	1.4		x		5.77	X		0.4] _x [0.7	= =	32.35	(76)
East	0.9x	0.77	x	1.4		X		0.22	l X		0.4]	0.7	= =	30.8	(76)
East	0.9x	0.77	×	1.4		x		4.68) 		0.4	」	0.7	= =	26.45	(76)
East	0.9x	0.77	×	1.4		x		3.59	X		0.4]	0.7	= =	20.56	(76)
East	0.9x	0.77	×	1.4		x		5.59	l x		0.4] ^ [] _x [0.7	-	12.74	(76)
East	0.9x	0.77	_ x	1.4		X		4.49	X	_	0.4] ^ [] _x [0.7	= =	6.84	(76)
East	0.9x		=			X			^ x			」^[] _x [= -		(76)
Luot	0.91	0.77	X	1.4	14	^	10	6.15	^		0.4	J ^ L	0.7	=	4.51	(70)
Solar	raine in r	watts, cald	aulatad	for oac	h mani	·h			(93)m	v – Sur	m(74)m	(92)m				
(83)m=	26.62		86.29	135.99	180.00	$\overline{}$	91.28	179.18	144		103.05	60.8	32.91	22.13	1	(83)
		nternal an	d solar						<u> </u>					<u> </u>	J	. ,
(84)m=	409.56		455.3	485.85	510.63	<u> </u>	03.2	478.96	449	.51	418.21	395.3	389.59	395.29	1	(84)
7 Mc	an intor	nal tempe	rature	'hoating	50250	n)					<u> </u>			<u> </u>		
		during he					area f	rom Tah	ole 0	Th1	(°C)				21	(85)
		tor for gai	•			_			טוע אור.	, 1111	(0)					(00)
Otilisa	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	٨	ug	Sep	Oct	Nov	Dec	1	
(86)m=	0.99	0.99	0.96	0.86	0.67	$\overline{}$	0.46	0.33	0.3		0.6	0.89	0.98	0.99	╡	(86)
(50)///-	3.55	0.00	0.00	0.00	0.07			0.00	L	<u>' </u>	0.0	0.00	1 0.00	I 3.33	J	(30)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.62 20.7 20.82 20.95 21 21 21 21 21 20.95 20.78 20.62]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	1	
(88)m= 20.44 20.45 20.45 20.46 20.47 20.48 20.48 20.48 20.48 20.47 20.46 20.46]	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	•	
(89)m= 0.99 0.98 0.96 0.84 0.63 0.42 0.29 0.32 0.55 0.86 0.98 0.99]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 19.94 20.05 20.22 20.41 20.46 20.48 20.48 20.48 20.48 20.41 20.18 19.94	1	(90)
fLA = Living area ÷ (4) =	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_
(92)m= 20.22 20.31 20.47 20.63 20.68 20.69 20.69 20.7 20.69 20.63 20.43 20.22]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1	
(93)m= 20.22 20.31 20.47 20.63 20.68 20.69 20.69 20.7 20.69 20.63 20.43 20.22		(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-calc the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.98 0.96 0.85 0.65 0.44 0.31 0.34 0.57 0.87 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m	,	4
(95)m= 405.9 424.91 435.38 411.84 330.15 219.08 147.22 153.57 239.16 344.71 380.02 392.44]	(95)
Monthly average external temperature from Table 8	1	(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	J	(96)
Heat loss rate for mean internal temperature, Lm, W = [(39)m x [(93)m - (96)m] (97)m = 615.66 592.85 534.28 436.6 332.32 219.12 147.22 153.57 239.7 371.18 498.74 606.04	1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	J	(01)
(98)m= 156.06 112.85 73.58 17.83 1.62 0 0 0 19.69 85.47 158.91	1	
Total per year (kWh/year) = Sum(98) _{15,912} =	626.01	(98)
Space heating requirement in kWh/m²/year]](99)
	9.45	(99)
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources;	he latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 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 heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	-
Annual space heating requirement	626.01]

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	657.31	(307a)
Efficiency of secondary/supplementary heating system in % (f		0](308
Space heating requirement from secondary/supplementary sy	, ,	0] (309)
			J` ′
Water heating Annual water heating requirement		1784.71	7
If DHW from community scheme:	(0.1) (0.00) (0.05) (0.00)		J
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1873.94	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =		(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	m outside	118.21	(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) =	118.21	(331)
Energy for lighting (calculated in Appendix L)		311.73	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (31	2) + (315) + (331) + (332)(237b) =	2443.02	(338)
12h CO2 Emissions Community heating schores			
12b. CO2 Emissions – Community heating scheme		_	
12b. CO2 Emissions – Community fleating scrieme	Energy Emission facto		
CO2 from other sources of space and water heating (not CHF	kWh/year kg CO2/kWh	kg CO2/year	7,007
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second for	kg CO2/year	(367a)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for th	kg CO2/year uel 256 = 513.17	(367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b) [(307b)	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for th	kg CO2/year uel 256 = 513.17 = 13.14	(367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for th	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31	(367) (372) (373)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second f 1)+(310b)] x 100 ÷ (367b) x 10.52 1(313) x 10.52 1(363)(366) + (368)(372) 1(309) x 10	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31 = 0	(367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second f 1)+(310b)] x 100 ÷ (367b) x 10.52 1(313) x 10.52 1(363)(366) + (368)(372) 1(309) x 10 10 11 11 12 12 13 14 15 16 16 16 16 16 16 16 16 16 16 16 16 16	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second f 3)+(310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.52	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31 = 0	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second f 3)+(310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.52	kg CO2/year 256 = 513.17 = 13.14 = 526.31 = 0 = 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe CO2 associated with electricity for lighting	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for th	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31 = 0 = 0 526.31	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for th	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31 = 0 526.31 = 0 51.35 = 161.79	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instanta Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe co2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applied	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second f 1)+(310b)] x 100 ÷ (367b) x 10.52 1(313) x 10.52 1(363)(366) + (368)(372) 1(309) x 10 10 11 11 12 12 13 13 14 15 15 16 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18	kg CO2/year 256 = 513.17 = 13.14 = 526.31 = 0 526.31 = 61.35 = 161.79	(367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instanta Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe co2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applitum 1	kWh/year kg CO2/kWh 2) ing two fuels repeat (363) to (366) for the second f 1)+(310b)] x 100 ÷ (367b) x 10.52 1(313) x 10.52 1(363)(366) + (368)(372) 1(309) x 10 10 11 11 12 12 13 13 14 15 15 16 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18	kg CO2/year uel 256 = 513.17 = 13.14 = 526.31 = 0 526.31 = 61.35 = 161.79	(367) (372) (373) (374) (375) (376) (378) (379) (380)

		User E	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Proporty	Strom Softwa Address	are Ve	rsion:		Versio	on: 1.0.5.51	
Address :		торену	Address	Sample	e i (iviia))			
1. Overall dwelling dime	nsions:								
0			a(m²)		Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor			66.25	(1a) x		3	(2a) =	198.75	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (66.25	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	198.75	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0] = [0	X	20 =	0	(6b)
Number of intermittent fa	ns	_		Ī	2	X	10 =	20	(7a)
Number of passive vents				Ē	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	Х	40 =	0	(7c)
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)$				20		÷ (5) =	0.1	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, proced	ed to (17),	otherwise (continue fr	om (9) to ((16)		0	7 (0)
Additional infiltration	ie dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction			0	(11)
	resent, use the value corresponding t	to the grea	ter wall are	a (after					
deducting areas of openir	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or () 1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, en	,	7.1 (ocan	<i>5a)</i> , 0100	critor o				0	(13)
	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metr	-	•	•	etre of e	envelope	area	5	(17)
·	ity value, then $(18) = [(17) \div 20] +$. , .	,		0.35	(18)
Number of sides sheltere	s if a pressurisation test has been do d	ne or a de	gree air pe	rmeability	is being u	sed		2	(19)
Shelter factor	G		(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
. ,				<u> </u>	L	Ц		J	

Adjusted infiltration rate (allo	wing for shelter a	and wind st	need) =	(21a) x	(22a)m					
0.38 0.37 0.37		0.28	0.28	0.28	0.3	0.32	0.34	0.35		
Calculate effective air chang		licable cas	se							
If mechanical ventilation:									0	(23a)
If exhaust air heat pump using Ap) = (23a)			0	(23b)
If balanced with heat recovery: e	ficiency in % allowing	g for in-use fa	actor (from	n Table 4h) =				0	(23c)
a) If balanced mechanical			• (- ` ` - 	ŕ	, 		```	÷ 100]	(5.4.)
(24a)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical	i i		• •	<u> </u>	í `	r ´ `	- 		1	(0.41)
(24b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract v if (22b)m < 0.5 × (23b)	•	•				.5 × (23b	o)		_	
(24c)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or v if (22b)m = 1, then (24	•					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 (24	4b) or (24c	c) or (24	d) 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 los	s parameter:							_	_	
ELEMENT Gross area (m²)	Openings m ²	Net Are A ,m		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
Doors		2.4	x	1	=	2.4	$\stackrel{'}{\sqcap}$			(26)
Windows Type 1		4.8	x1/	/[1/(1.4)+	0.04] =	6.36	Ħ			(27)
Windows Type 2		5.44	x1/	/[1/(1.4)+	0.04] =	7.21	Ħ			(27)
Windows Type 3	_	1.44	x1/	/[1/(1.4)+	0.04] =	1.91				(27)
Walls Type1 10.24	10.24	0	x	0.18	=	0				(29)
Walls Type2 1.44	1.44	0	x	0.18	<u> </u>	0	$\overline{}$		$\exists \ $	(29)
Walls Type3 13.2	2.4	10.8	x	0.18	=	1.94				(29)
Walls Type4 2.4	0	2.4	x	0.18	=	0.43				(29)
Total area of elements, m ²		27.28								(31)
* for windows and roof windows, us ** include the areas on both sides o			ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric heat loss, W/K = S (A	x U)			(26)(30)) + (32) =				20.26	(33)
Heat capacity Cm = S(A x k)				((28).	(30) + (32	2) + (32a).	(32e) =	184.8	(34)
Thermal mass parameter (TI	MP = Cm ÷ TFA)	in kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assessments where the can be used instead of a detailed can		ction are not	known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridges : S (L x Y) o	alculated using A	Appendix K	(1.36	(36)
if details of thermal bridging are not Total fabric heat loss	known (36) = 0.05 x	(31)			(33) +	(36) =			21.62	(37)
Ventilation heat loss calculat	ed monthly				(38)m	= 0.33 × ((25)m x (5))		
Jan Feb Ma	r Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 37.53 37.35 37.16	36.32 36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38)
Heat transfer coefficient, W/k	((39)m	= (37) + (37)	38)m			
(39)m= 59.15 58.97 58.79	57.94 57.78	57.05	57.05	56.91	57.33	57.78	58.11	58.44	<u> </u>	
Stroma FSAP 2012 Version: 1.0.5.5	1 (SAP 9.92) - http://	www.stroma.	com			Average =	Sum(39) ₁	12 /12=	57.9 ≱ a	age 2 of 3 9)

Heat loss para	ameter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.89	0.89	0.89	0.87	0.87	0.86	0.86	0.86	0.87	0.87	0.88	0.88		
	!	<u> </u>			<u> </u>	<u>I</u>	<u> </u>		Average =	Sum(40) ₁ .	12 /12=	0.87	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occi			[4	/ o oooo	140 /TF	- 400	\0\1 · 0 /	2042 /	TEA 40		15		(42)
if TFA > 13. if TFA £ 13.		+ 1.76 X	[1 - exp	(-0.0003	349 X (11	-A -13.9)2)] + 0.0	J013 X (IFA -13.	.9)			
Annual average	•	ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		85	5.3		(43)
Reduce the annu-	•		• .		-	-	to achieve	a water us	se target o				, ,
not more that 125	litres per j	person per	day (all w	ater use, I	not and co	la)						ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
_					400 1//	_	- (ooo			m(44) ₁₁₂ =		1023.65	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x L	01m/3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
If instantaneous	votor hosti	ng at paint	of upo (no	hot water	r otorogo)	ontor () in	haves (16		Total = Su	m(45) ₁₁₂ =	=	1342.17	(45)
If instantaneous v						_							
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage Storage volum		includin	na any sa	olar or M	/M/HRS	storage	within s	ame ves	ച		450		(47)
								arric ves.	301		150		(47)
If community hotherwise if no	_			_				ers) ente	er 'Ω' in <i>(</i>	47)			
Water storage		not wate	71 (tillo III	1014400 1	notantai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	010) 01110	31 O III (,			
a) If manufac		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b			- ,					54		(49)
Energy lost fro				ear			(48) x (49)) =			75		(50)
b) If manufac		_	-		or is not			,		0.			(55)
Hot water stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3									•	
Volume factor											0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33		00.00	00.50	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
` '	21.07	23.33	22.58	20.00									(37)
		<u> </u>					<u>I</u>		!		0		(58)
Primary circuit	loss (ar	nnual) fro	m Table	3		<u> </u>	65 × (41)	ım	•		0		, ,
Primary circuit	loss (ar loss cal	nnual) fro culated f	m Table for each	3 month (59)m = ((58) ÷ 36	, ,		r thermo		0		, ,

Combi lo	ss 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 hea	at requ	ired for	water he	eating ca	alculated	for eacl	n month	(62)m	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 18	85.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		(62)
Solar DHW	input c	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribut	ion to wate	er heating)	J	
(add addi	itional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendi	x G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output fro	om wa	iter hea	ter											
(64)m= 18	85.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		_
						-	-	0	output from w	ater heate	r (annual)₁	12	1890.79	(64)
Heat gair	ns fron	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 8	33.54	74.14	79.03	72.48	72.21	66.22	65.21	69.33	3 68.51	75.08	77.34	82.08		(65)
include	e (57)n	n in calc	culation of	of (65)m	only if c	ylinder is	s in the o	dwellir	ng or hot w	ater is f	om com	munity h	eating	
5. Interi	nal ga	ins (see	Table 5	and 5a)):									
Metabolio	c gains	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 10	07.59	107.59	107.59	107.59	107.59	107.59	107.59	107.5	107.59	107.59	107.59	107.59		(66)
ا Ligh <mark>ting و</mark>	gains (calculat	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso se	e Table 5					
(67)m= 1	17.21	15.29	12.43	9.41	7.04	5.94	6.42	8.34	11.2	14.22	16.59	17.69		(67)
Appliance	es gaiı	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ıble <mark>5</mark>			'	
(68)m= 18	88.39	190.35	185.42	174.93	161.69	149.25	140.94	138.9	143.91	154.4	167.64	180.08		(68)
Cooking	gains	(calcula	ted in A	pendix	L, equa	tion L15	or L15a)	, also	see Table	5		•	'	
(69)m= 3	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	6 33.76	33.76	33.76	33.76		(69)
Pumps a	nd fan	s gains	(Table 5	 ia)		•		•	•	•	•	•	ı	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e	g. eva	aporatio	n (negat	ive valu	es) (Tab	le 5)			•	•	•		ı	
(71)m= -8	86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.0	7 -86.07	-86.07	-86.07	-86.07		(71)
Water he	eating	gains (T	able 5)							· ·		Į.	I	
_		110.32	106.23	100.67	97.05	91.97	87.65	93.18	95.15	100.91	107.41	110.33		(72)
Total into	ernal	gains =				(66)	m + (67)m	ı + (68)ı	m + (69)m +	(70)m + (7	(1)m + (72)	m	I	
_	76.17	374.23	362.36	343.29	324.06	305.44	293.28	298.7	9 308.54	327.8	349.92	366.38		(73)
6. Solar	gains													
Solar gain	ns are ca	alculated	using sola	r flux from	Table 6a	and associ	ated equa	tions to	convert to the	ne applicat	ole orientat	ion.		
Orientation			actor	Area		Flu			g_		FF		Gains	
	T	able 6d		m²		Tal	ole 6a		Table 6b	Т	able 6c		(W)	
North	0.9x	0.77	X	4.8	3	x 1	0.63	×	0.63	X	0.7	=	15.6	(74)
North	0.9x	0.77	X	5.4	4	x 1	0.63	x	0.63	X	0.7	=	17.68	(74)
North	0.9x	0.77	X	4.8	3	x 2	0.32	x	0.63	X	0.7	=	29.81	(74)
North	0.9x	0.77	х	5.4	4	x 2	0.32	x	0.63	x	0.7	=	33.78	(74)

North	0.9x	0.77	—] ,					4.50	1 .		0.00	ا پ ٦	0.7		50.0	(74)
North	0.9x C	0.77	X	4.8		X		4.53	X		0.63	」 [×]	0.7	_ =	50.6	
North	0.9x C	0.77	X	5.4		X		4.53	X		0.63	」	0.7	_ =	57.4	
North	<u> </u>	0.77	X	4.8		X		5.46	X		0.63	X	0.7	_ =	81.3	
North	0.9x	0.77	X	5.4		X		5.46	X		0.63	X	0.7	╡ -	92.2	 -
	0.9x	0.77	×	4.8		X		4.72	X		0.63	X 	0.7	╡ =	109.	
North	0.9x	0.77	×	5.4		X		4.72	X		0.63	_ ×	0.7	╡ =	124.	
North	0.9x	0.77	×	4.8	8	X		9.99	X		0.63	_ ×	0.7	=	117.	 -
North	0.9x	0.77	X	5.4	4	X	7:	9.99	X		0.63	X	0.7	ᆗ =	132.	98 (74)
North	0.9x	0.77	Х	4.8	8	X	7.	4.68	X		0.63	X	0.7	=	109.	55 (74)
North	0.9x	0.77	X	5.4	4	X	7.	4.68	X		0.63	X	0.7	=	124.	15 (74)
North	0.9x	0.77	X	4.8	8	X	5	9.25	X		0.63	X	0.7	=	86.9	(74)
North	0.9x	0.77	X	5.4	l4	X	5	9.25	X		0.63	X	0.7	=	98.	5 (74)
North	0.9x	0.77	X	4.8	8	X	4	1.52	X		0.63	X	0.7	=	60.9	9 (74)
North	0.9x	0.77	X	5.4	14	X	4	1.52	X		0.63	X	0.7	=	69.0	(74)
North	0.9x	0.77	X	4.8	8	X	2	4.19	X		0.63	x	0.7	=	35.4	(74)
North	0.9x	0.77	X	5.4	4	x	24	4.19	X		0.63	X	0.7	=	40.2	(74)
North	0.9x	0.77	X	4.8	8	x	1;	3.12	x		0.63	x	0.7	=	19.2	(74)
North	0.9x	0.77	х	5.4	l4	X	1:	3.12	Х		0.63	X	0.7	=	21.8	(74)
North	0.9x	0.77	x	4.8	В	x	8	.86	x		0.63	x	0.7	=	13	(74)
North	0.9x	0.77	x	5.4	14	х	8	3.86	x		0.63	x	0.7	=	14.7	(74)
East	0.9x	0.77	x	1.4	14	x	19	9.64	x		0.63	x	0.7	=	8.6	(76)
East	0.9x	0.77	x	1.4	14	X	3	8.42	Х		0.63	x	0.7		16.9	(76)
East	0.9x	0.77	x	1.4	14	x	6:	3.27	Х		0.63	x	0.7		27.8	(76)
East	0.9x	0.77	x	1.4	14	х	9:	2.28	x		0.63	x	0.7		40.6	(76)
East	0.9x	0.77	x	1.4	ļ4	х	11	3.09	x		0.63	x	0.7	_ =	49.7	7 (76)
East	0.9x	0.77	x	1.4	14	x	11	5.77	x		0.63	×	0.7	_ =	50.9	(76)
East	0.9x	0.77	x	1.4	14	x	11	0.22	x		0.63	X	0.7	_ =	48.5	(76)
East	0.9x	0.77	x	1.4	l4	X	9,	4.68	X		0.63	i x	0.7		41.6	7 (76)
East	0.9x	0.77	x	1.4	ļ4	x	7:	3.59	X		0.63	X	0.7		32.3	(76)
East	0.9x	0.77	x	1.4		X		5.59	X		0.63	X	0.7	╡ -	20.0	 -
East	0.9x	0.77	×	1.4		X		4.49	X	_	0.63	_	0.7	╡ -	10.7	
East	0.9x	0.77	X	1.4		x		6.15	X	_	0.63	_	0.7	╡.	7.1	
	S.S.	0.77	^	1.7				0.10] ^		0.00	J ^ I	0.7		/.1	(, 0)
Solar o	nains in	watts, cal	culated	for eacl	h mont	h			(83)m	ı = Sui	m(74)m	.(82)m				
(83)m=	41.92		135.91	214.19	283.59	$\overline{}$	01.26	282.2	227		162.31	95.76	51.83	34.85		(83)
Total g	jains – ir	nternal an	nd solar	(84)m =	(73)n	1 + (a	83)m ,	watts	<u> </u>							
(84)m=	418.09	454.73	498.27	557.47	607.6	5 6	606.7	575.48	525	.86	470.85	423.57	401.75	401.22		(84)
7. Me	an inter	nal tempe	erature	(he <u>ating</u>	seaso	n)										
		during he					area f	rom Tab	ole 9.	, Th1	(°C)				21	(85)
		tor for gai	• .			_			•		` '					``
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.94	0.8	_	0.59	0.43	0.4		0.78	0.96	0.99	1	7	(86)
		ı	[-	1				L		1	<u>I</u>		

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.15 20.26 20.46 20.74 20.93 20.99 21 21 20.96 20.71 20.39 20.13 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.17 20.18 20.18 20.19 20.19 20.2 20.2 20.2 20.2 20.19 20.19 20.18 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90) fLA = Living area ÷ (4) = 0.41 (91)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.17 20.18 20.18 20.19 20.19 20.2 20.2 20.2 20.2 20.19 20.19 20.18 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(88)m= 20.17 20.18 20.18 20.19 20.19 20.2 20.2 20.2 20.19 20.19 20.19 20.18 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(89)m= 1 0.99 0.98 0.92 0.76 0.52 0.36 0.41 0.71 0.95 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.16 19.86 19.4 19.02 (90)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.16 19.86 19.4 19.02 (90)
(90)m= 19.04 19.2 19.49 19.88 20.12 20.2 20.2 20.16 19.86 19.4 19.02 (90)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$
(92)m= 19.49 19.63 19.89 20.23 20.45 20.52 20.53 20.49 20.21 19.8 19.48 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate
(93)m= 19.49 19.63 19.89 20.23 20.45 20.52 20.53 20.49 20.21 19.8 19.48 (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=
Useful gains, hmGm, $W = (94)m \times (84)m$ $(95)m = 416.12 \ 450.79 \ 487.2 \ 514.37 \ 469.72 \ 334.2 \ 223.76 \ 234.19 \ 346.69 \ 402.44 \ 397.68 \ 399.73$ (95)
Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m–(96)m]]
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(98)m= 359.08 280.92 223.13 102.45 26.86 0 0 0 113.72 245.16 366.77
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1718.09 (98)
Space heating requirement in kWh/m²/year 25.93 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (201)
Fraction of space heat from main system(s) $(202) = 1 - (201) = 1$ (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1
Efficiency of secondary/supplementary heating system, % 0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)
359.08 280.92 223.13 102.45 26.86 0 0 0 113.72 245.16 366.77
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211)
384.04 300.45 238.64 109.57 28.73 0 0 0 121.62 262.2 392.27
Total (kWh/year) =Sum(211) _{15,1012} = 1837.53 (211)

Space heating fuel (secondary), kWh/month									
$= \{[(98)m \times (201)]\} \times 100 \div (208)$									
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		
,		_	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	_	0	(215)
Water heating									
Output from water heater (calculated above) 185.75 163.79 172.18 154.58 151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		
Efficiency of water heater	135.75	130.6	143	142.64	160.28	169.19	181.36	70.0	(216)
(217)m= 86.54 86.24 85.51 83.75 81.25	79.8	79.8	79.8	79.8	83.92	85.8	86.66	79.8	(217)
Fuel for water heating, kWh/month	70.0	70.0	70.0	70.0	00.02	00.0	00.00		(=,
(219) m = (64) m x $100 \div (217)$ m								ı	
(219)m= 214.63 189.92 201.37 184.58 186.66	170.11	163.66	179.19	178.75	191	197.19	209.29		_
			Tota	I = Sum(2				2266.36	(219)
Annual totals					k\	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1								1837.53	╡
Water heating fuel used								2266.36	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
boi <mark>ler with a fan-ass</mark> isted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								303.98	(232)
Total delivered energy for all uses (211)(221)	+ (231)	+ (232).	(237b)	=				4482.87	(338)
12a. CO2 emissions – Individual heating syste	ms inclu	uding mi	cro-CHP						
	En	ergy			Emiss kg CO	ion fac	tor	Emissions	
Occasion to active description at an A)		/h/year					ı		_
Space heating (main system 1)		1) x			0.2	16	=	396.91	(261)
Space heating (secondary)	(215	5) x			0.5	19	=	0	(263)
Water heating	(219	9) x			0.2	16	=	489.53	(264)
Space and water heating	(261	1) + (262)	+ (263) + (264) =				886.44	(265)
Electricity for pumps, fans and electric keep-hot	(231	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232	2) x			0.5	19	=	157.76	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1083.13	(272)
							1		_

TER =

(273)

23.71

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height:

66.25 m² Floor 0 3 m

27.2 m² (fraction 0.411) Living area:

Unspecified Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:		Argon:	Fr	ame:
DOO	R	<u>Manuf</u> actur	er Solid				W	ood
W		Manufactur	er Windows	low-E, $En = 0.09$	5, soft coat	No		
N		Manufactur	er Windows	low-E, $En = 0.09$	5, soft coat	No		
Balco	ony	Manufactur	rer Windows	low-E, $En = 0.09$	5, soft coat	No		

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
N		0.7	0.4	1	10.24	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
N		N	North	0	0
Balcony		N	North	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
N	31.8	15.04	16.76	0.15	0	False	N/A
W	18.75	1.44	17.31	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No

Photovoltaics: <u>Photovoltaic 1</u>

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20			Strom Softwa	are Ve	rsion:		Versio	on: 1.0.5.51	
		Р	roperty	Address	Sample	e 2 (Mid)			
Address: 1. Overall dwelling dime	oncione:									
1. Overall dwelling diffe	F1310113.		Δre	a(m²)		Δv He	eight(m)		Volume(m	3)
Ground floor					(1a) x	Av. He	3	(2a) =	198.75	(3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(*	1e)+ (1r	n)	66.25	(4)			J` ′		
Dwelling volume	۵,۰(۱۵,۰(۱۵,۰(۱۵,۰		.,	00.23)+(3c)+(3c	d)+(3e)+	(3n) =	400.75	
					(00)1(00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	u)	(011) =	198.75	(5)
2. Ventilation rate:	main	secondai	v	other		total			m³ per hou	ır
Number of chimneys	heating	heating	, 기 + ୮		7 = F			40 =		
,		0	╛╘	0	╛╘	0			0	(6a)
Number of open flues	0 +	0	_	0] = [0		20 =	0	(6b)
Number of intermittent fa	ins					0	X	10 =	0	(7a
Number of passive vents						0	X	10 =	0	(7 b)
Number of flueless gas f	ires					0	X	40 =	0	(7c
					_			A 1		
					_		<u> </u>	Air cr	nanges per h	our —
Infiltration due to chimne						0		\div (5) =	0	(8)
If a pressurisation test has be Number of storeys in t		iaea, procee	a to (17), (otnerwise (continue fi	rom (9) to	(16)		0	(9)
Additional infiltration	is all simily (ris)						[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0	.25 for steel or timbe	er frame or	0.35 fo	r masoni	y const	ruction			0	(11
	resent, use the value corre	esponding to	the great	ter wall are	a (after					
deducting areas of openial If suspended wooden to	• / .	aled) or 0	1 (seale	ad) else	enter ()				0	(12
If no draught lobby, en	,	•	i (ocaic	<i>Ju)</i> , 0100	Citici o				0	(13
Percentage of window	•								0	(14
Window infiltration	5	• •		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16
Air permeability value,	q50, expressed in co	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17
If based on air permeabi	-								0.15	(18
Air permeability value applie		nas been dor	ne or a de	gree air pe	rmeability	is being u	ised		<u> </u>	<u> </u>
Number of sides sheltere Shelter factor	; a			(20) = 1 -	0.075 x (19)] =			0.85	(19
Infiltration rate incorpora	ting shelter factor			(21) = (18		- /1			0.83	(21
Infiltration rate modified f	-	ed		() (-)	(-)				0.13	(21
Jan Feb	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp	1	<u> </u>	L	1		1	1	1	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
· · <u> </u>			I	1	<u> </u>	1	1	1	J	
Wind Factor (22a)m = (2	2)m ÷ 4		ı	·					1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		_	rate for t	he appli	cable ca	se	l				!	, 	
If mechanica			l' N. (0	01) (00	/	(1	15// (1	. (00)) (OO)			0.5	(238
If exhaust air h) = (23a)			0.5	(23b
If balanced with		•	-	_								79.05	(230
a) If balance						<u> </u>	- ` ` - 	ŕ	- 		- ` 	i ÷ 100] I	(246
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24a
b) If balance							r ``	i `	 	- 	Ι ,	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h				•	•				.5 × (23b	p)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and he	eat loss	paramete	er:								_	
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1.4	=	3.36				(26)
Win <mark>dows</mark> Type	1				1.44	×	1/[1/(1)+	0.04] =	1.38	Ħ			(27)
Windows Type	2				10.24	X	1/[1/(1)+	0.04] =	9.85	Ħ			(27)
Windows Type	3				4.8	x	1/[1/(1)+	0.04] =	4.62	5			(27)
Walls Type1	31.	8	15.04	1	16.76	x	0.15		2.51				(29)
Walls Type2	18.7	' 5	1.44		17.31	x	0.15		2.6			7 F	(29)
Walls Type3	11.	1	2.4		8.7	x	0.15	=	1.3	F i			(29)
Walls Type4	2.4		0	=	2.4	X	0.35	=	0.84	=		5 H	(29)
Total area of e	L	i			64.05								(31)
* for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	1 3.2	,
** include the area	as on both	sides of in	nternal wal	s and part	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				26.46	(33)
Heat capacity		,						((28).	(30) + (32	2) + (32a).	(32e) =	632.38	(34)
Thermal mass	•	`		,					tive Value			250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge					-	<						9.61	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			36.07	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 17.53	17.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7		(38)
Heat transfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 53.6	53.39	53.18	52.14	51.93	50.88	50.88	50.67	51.3	51.93	52.34	52.76		
Stroma FSAP 201	2 Version	1.0.5.51 ((SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	52.0β	age 2 of 349)

eat lo	ss para	meter (H	ILP), W/	m²K			•	•	(40)m	= (39)m ÷	(4)			
0)m=	0.81	0.81	0.8	0.79	0.78	0.77	0.77	0.76	0.77	0.78	0.79	0.8		
umba	or of dov	o in mar	sth (Tabl	lo 1o)					,	Average =	Sum(40) ₁ .	12 /12=	0.79	(4
umbe	Jan	s in mor Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
.,	<u> </u>		0.	00	.			.				<u> </u>		•
1. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssum	ied occu	pancy, N	N								2.	15		(4
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	9)			
nnua	l averag	e hot wa						(25 x N)				5.3		(4
		ll average litres per p				_	_	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate		n litres per							СОР		1101			
4)m=	93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
							·			Total = Su			1023.65	(
								Tm / 3600						
5)m=	139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		— ,
nstanı	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =		1342.17	(
6)m=	2 0.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(
ater	storage	loss:								<u> </u>		<u> </u>		
torag	e volum	e (litres)	includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(
	•	eating a			_			' '		(O) : (47)			
	vise ii no storage		not wate	er (unis iri	iciuaes i	nstantar	ieous co	mbi boil	ers) erite	er o in (47)			
	•	urer's de	eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(
empe	erature fa	actor fro	m Table	2b								0		(
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(
		urer's de		-										
		age loss eating s			e 2 (kW	h/litre/da	ıy)				0.	.02		(
	-	from Tal		JII 4.J							1	.03		(
		actor fro		2b								.6		(
nera\	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		03		(
٠.		54) in (5	•	,								03		(
ater	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
6)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
		dedicated	d solar sto			x [(50) – (7)m = (56)	m where (H11) is fro	m Appendi	x H	
7)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
imar	y circuit	loss (an	nual) fro	m Table	3							0		(
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
IIIIai					•		. ,	, ,						
	dified by	factor fr	om Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m													
(61)m= 0 0 0	0 0	0 0	0	0	0	0	0		(61)				
Total heat required for water I	neating calculate	d for each mont	h (62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m					
(62)m= 194.43 171.63 180.87	162.99 160.34	144.15 139.29	151.68	151.05	168.96	177.59	190.04		(62)				
Solar DHW input calculated using Ap	pendix G or Append	x H (negative quant	ity) (enter '0)' if no sola	r contribut	ion to wate	er heating)	•					
(add additional lines if FGHR	S and/or WWHR	S applies, see A	ppendix (G)									
(63)m= 0 0 0	0 0	0 0	0	0	0	0	0		(63)				
FHRS 17.95 15.96 16.41	14.51 13.96	12.12 11.22	12.87	13.02	15.02	16.24	17.46		(63) (G2)				
Output from water heater								_					
(64)m= 173.8 153.25 161.77	145.88 143.69	129.44 125.38	136.13	135.43	151.27	158.76	169.9		_				
			Out	put from wa	ater heate	r (annual)₁	12	1784.71	(64)				
Heat gains from water heating	g, kWh/month 0.2	25 ´ [0.85 × (45)	m + (61)n	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]					
(65)m= 90.49 80.41 85.98	79.2 79.15	72.94 72.15	76.27	75.23	82.02	84.06	89.03		(65)				
include (57)m in calculation	of (65)m only if	cylinder is in the	dwelling	or hot w	ater is fr	om com	munity h	eating					
5. Internal gains (see Table	5 and 5a):												
Metabolic gains (Table 5), Wa	atts							_					
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec						
(66)m= 107.59 107.59 107.59	107.59 107.59	107.59 107.59	107.59	107.59	107.59	107.59	107.59		(66)				
Lighting gains (calculated in A	A <mark>ppen</mark> dix L, equ <mark>a</mark>	tion L9 or L9a),	also see	Table 5									
(67)m= 16.81 14.93 12.14	9.19 6.87	5.8 6.27	8.15	10.93	13.88	16.2	17.27		(67)				
Appliances gains (calculated	in Appendix L, e	quation L13 or L	13a), also	see Tal	ble 5								
(68)m= 188.39 190.35 185.42	174.93 161.69	149.25 140.94	138.98	143.91	154.4	167.64	180.08		(68)				
Cooking gains (calculated in A	A <mark>ppen</mark> dix L, equa	ation L15 or L15	a), also s	ee Table	5								
(69)m= 33.76 33.76 33.76	33.76 33.76	33.76 33.76	33.76	33.76	33.76	33.76	33.76		(69)				
Pumps and fans gains (Table	5a)	•	-	•				•					
(70)m= 0 0 0	0 0	0 0	0	0	0	0	0		(70)				
Losses e.g. evaporation (neg	ative values) (Ta	ble 5)	•	•				•					
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07	-86.07	-86.07	-86.07	-86.07		(71)				
Water heating gains (Table 5))	•	•					•					
(72)m= 121.63 119.66 115.56	110 106.39	101.3 96.98	102.52	104.49	110.25	116.75	119.66		(72)				
Total internal gains =		(66)m + (67)	m + (68)m	+ (69)m + ((70)m + (7	1)m + (72)	m						
(73)m= 382.1 380.21 368.4	349.4 330.23	311.63 299.46	304.93	314.61	333.8	355.86	372.29		(73)				
6. Solar gains:			•										
Solar gains are calculated using so	ar flux from Table 6a	and associated equ	uations to co	onvert to th	e applicat	ole orientat	ion.						
Orientation: Access Factor	Area	Flux	_	g_ -	_	FF		Gains					
Table 6d	m²	Table 6a	_	able 6b		able 6c		(W)	_				
North 0.9x 0.77	x 10.24	x 10.63	x	0.4	x	0.7	=	21.13	(74)				
North 0.9x 0.77	X 4.8	x 10.63	x	0.4	x	0.7	=	9.9	(74)				
North 0.9x 0.77	x 10.24	x 20.32	x	0.4	x	0.7	=	40.38	(74)				
North 0.9x 0.77	X 4.8	x 20.32	X	0.4	x	0.7	=	18.93	(74)				

	_		_		_			_						_
North	0.9x	0.77	X	10.24	X	34.53		X	0.4	x	0.7	=	68.61	(74)
North	0.9x	0.77	X	4.8	X	34.53		X	0.4	x	0.7	=	32.16	(74)
North	0.9x	0.77	X	10.24	X	55.46		X	0.4	x	0.7	=	110.21	(74)
North	0.9x	0.77	X	4.8	X	55.46		X	0.4	x	0.7	=	51.66	(74)
North	0.9x	0.77	X	10.24	X	74.72		X	0.4	x	0.7	=	148.46	(74)
North	0.9x	0.77	X	4.8	X	74.72		X	0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	X	10.24	X	79.99		X	0.4	x	0.7	=	158.93	(74)
North	0.9x	0.77	X	4.8	X	79.99		x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	10.24	X	74.68		x	0.4	x	0.7	=	148.38	(74)
North	0.9x	0.77	X	4.8	X	74.68		X	0.4	x	0.7	=	69.55	(74)
North	0.9x	0.77	X	10.24	X	59.25		x	0.4	x	0.7	=	117.72	(74)
North	0.9x	0.77	X	4.8	X	59.25		X	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	X	10.24	X	41.52		X	0.4	x [0.7	=	82.49	(74)
North	0.9x	0.77	X	4.8	X	41.52		X	0.4	х	0.7	=	38.67	(74)
North	0.9x	0.77	X	10.24	X	24.19		x	0.4	х	0.7	=	48.06	(74)
North	0.9x	0.77	X	4.8	X	24.19		x	0.4	x	0.7	=	22.53	(74)
North	0.9x	0.77	X	10.24	X	13.12		X	0.4	x	0.7	=	26.06	(74)
North	0.9x	0.77	X	4.8	X	13.12		X	0.4	Х	0.7	=	12.22	(74)
North	0.9x	0.77	X	10.24	Х	8.86		x	0.4	x	0.7	=	17.61	(74)
North	0.9x	0.77	x	4.8	X	8.86		×	0.4	x	0.7	=	8.26	(74)
West	0.9x	0.77	X	1.44	X	19.64		x	0.4	x	0.7	=	5.49	(80)
West	0.9x	0.77	x	1.44	X	38.42		Х	0.4	x	0.7	=	10.74	(80)
West	0.9x	0.77	x	1.44	X	63.27		X	0.4	x	0.7	=	17.68	(80)
West	0.9x	0.77	X	1.44	X	92.28		x	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	X	1.44	X	113.09		x	0.4	x	0.7	=	31.6	(80)
West	0.9x	0.77	X	1.44	X	115.77		X	0.4	х	0.7	=	32.35	(80)
West	0.9x	0.77	X	1.44	X	110.22		x	0.4	x	0.7	=	30.8	(80)
West	0.9x	0.77	X	1.44	X	94.68		x	0.4	x	0.7	=	26.45	(80)
West	0.9x	0.77	X	1.44	X	73.59		X	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	X	1.44	X	45.59		X	0.4	x [0.7	=	12.74	(80)
West	0.9x	0.77	X	1.44	X	24.49		x	0.4	x [0.7	=	6.84	(80)
West	0.9x	0.77	X	1.44	X	16.15		x	0.4	x	0.7	=	4.51	(80)
Ť		watts, calc	ulated	for each mo	_			3)m =	Sum(74)m .	(82)m		,		
(83)m=	36.52	<u> </u>	18.45	187.65 249.		65.77 248		199.36	141.72	83.33	45.12	30.38		(83)
Ī				(84)m = (73)										
(84)m=	418.62	450.25 4	186.85	537.05 579.	88 5	77.41 548	.19 5	504.28	456.33	417.14	400.99	402.68		(84)
7. Mea	an inter	nal temper	rature (heating seas	on)									
Tempe	erature	during hea	ating pe	eriods in the	living	area from	Table	9, T	h1 (°C)				21	(85)
Utilisa <u>-</u>	tion fac	tor for gair	ns for li	ving area, h1	,m (s	ee Table 9	9a) <u> </u>							
	Jan	Feb	Mar	Apr Ma	ау	Jun Ju	ال	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93 0.7	3	0.56 0.4	11	0.46	0.74	0.96	0.99	1		(86)
_														

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)												
(87)m= 20.28 20.38 20.56 20.8 20.95 21 21 21 20.98 20.79 20.5 20.27	(87)											
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_											
(88)m= 20.25 20.25 20.25 20.26 20.27 20.28 20.28 20.28 20.28 20.27 20.26 20.26	(88)											
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	-											
(89)m= 1 0.99 0.98 0.91 0.73 0.5 0.34 0.39 0.68 0.94 0.99 1	(89)											
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	-											
(90)m= 19.28 19.42 19.69 20.04 20.23 20.28 20.28 20.28 20.26 20.02 19.61 19.27	(90)											
fLA = Living area ÷ (4) =	0.41 (91)											
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$												
(92)m= 19.69 19.81 20.04 20.35 20.52 20.57 20.58 20.58 20.55 20.34 19.98 19.68	(92)											
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_											
(93)m= 19.69 19.81 20.04 20.35 20.52 20.57 20.58 20.58 20.55 20.34 19.98 19.68	(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-calc the utilisation factor for gains using Table 9a	culate _											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
Utilisation factor for gains, hm:												
(94)m= 0.99 0.99 0.98 0.91 0.75 0.52 0.37 0.42 0.7 0.94 0.99 1	<u>(94)</u>											
Useful gains, hmGm , W = (94)m x (84)m	7 (05)											
(95)m= 416.45 446.01 475.15 491.04 435.85 302.33 202.19 211.41 320.54 392.38 396.3 401.02	(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	7 (96)											
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m]]											
(97)m= 824.75 796.27 720.24 596.98 458.24 303.92 202.31 211.68 331.02 505.52 674.04 816.61												
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	1											
(98)m= 303.78 235.37 182.35 76.28 16.66 0 0 0 84.18 199.97 309.2]											
Total per year (kWh/year) = Sum(98) _{15,912} =	1407.78 (98)											
Space heating requirement in kWh/m²/year	21.25 (99)											
9b. Energy requirements – Community heating scheme												
This part is used for space heating, space cooling or water heating provided by a community scheme.												
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	the latter											
Fraction of heat from Community heat pump	1 (303a)											
Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304												
Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)												
Distribution loss factor (Table 12c) for community heating system												
Space heating	kWh/year											
Annual space heating requirement	1407.78											

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1478.17	(307a)
Efficiency of secondary/supplementary heating system in % (f	rom Table 4a or Appendix E)	0] (308)
Space heating requirement from secondary/supplementary sy	, ,	0] (309)
Water heating			_
Annual water heating requirement		1784.71	7
If DHW from community scheme: Water heat from Community heat pump	(C4) v (2025) v (205) v (206)	4070.04	
, , ,	$(64) \times (303a) \times (305) \times (306) =$	1873.94	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e		(313)
Cooling System Energy Efficiency Ratio	(407) - (044)	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	m outside	118.21	(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) =	118.21	(331)
Energy for lighting (calculated in Appendix L)		296.83	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (31	2) + (315) + (331) + (332)(237b) =	3248.97	(338)
12b. CO2 Emissions – Community heating scheme			
12b. CO2 Emissions – Community heating scheme		ctor Emissions	
	kWh/year kg CO2/kWh		
CO2 from other sources of space and water heating (not CHP	kWh/year kg CO2/kWh	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CO2/kWh	kg CO <mark>2/yea</mark> r](367a)](367)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon	kg CO2/year	J
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x 0.52	kg CO2/year and fuel 256 = 679.59	(367)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b] Electrical energy for heat distribution	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x 0.52	kg CO2/year and fuel 256 = 679.59 = 17.4	(367)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x [(313) x 0.52 (363)(366) + (368)(372) (309) x 0	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99	(367) (372) (373)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x 0	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99 = 0	(367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.22	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99 = 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.22	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99 = 0 696.99	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.22 (373) + (374) + (375) = selling (331)) x 0.52 (332))) x	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99 = 0 696.99 = 61.35 = 154.05	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x [(313) x 0.52 [(363)(366) + (368)(372) (309) x neous heater (312) x 0.22 (373) + (374) + (375) = elling (331)) x 0.52 cable	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99 = 0 696.99 = 61.35 = 154.05	(367) (372) (373) (374) (375) (376) (378) (379) (380)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1 Total CO2, kg/year sum of (376)(382) =	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x [(313) x 0.52 [(363)(366) + (368)(372) (309) x neous heater (312) x 0.22 (373) + (374) + (375) = elling (331)) x 0.52 cable	kg CO2/year and fuel 256 = 679.59 = 17.4 = 696.99 = 0 696.99 = 61.35 = 154.05	(367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHP Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1 Total CO2, kg/year sum of (376)(382) =	kWh/year kg CO2/kWh) ing two fuels repeat (363) to (366) for the secon)+(310b)] x 100 ÷ (367b) x [(313) x 0.52 [(363)(366) + (368)(372) (309) x neous heater (312) x 0.22 (373) + (374) + (375) = elling (331)) x 0.52 cable	kg CO2/year and fuel	(367) (372) (373) (374) (375) (376) (378) (379) (380) (383)

		User E	Details:											
Assessor Name: Software Name:	Stroma FSAP 2012	Proporty	Strom Softwa Address	are Ve	rsion:		Versio	on: 1.0.5.51						
Address :		торену	Address	. Sample	ez (IVIIG))								
1. Overall dwelling dime	nsions:													
			a(m²)	L	Av. He	ight(m)	٦	Volume(m ²	<u> </u>					
Ground floor			66.25	(1a) x		3	(2a) =	198.75	(3a)					
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (66.25	(4)										
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	198.75	(5)					
2. Ventilation rate:														
	main seconda heating heating	ry	other		total			m³ per hou	ır					
Number of chimneys	0 + 0	+	0] = [0	X	40 =	0	(6a)					
Number of open flues	0 + 0	_ + [0] = [0	X	20 =	0	(6b)					
Number of intermittent fa	ns				2	X	10 =	20	(7a)					
Number of passive vents				Ē	0	x	10 =	0	(7b)					
Number of flueless gas fi	res			F	0	Х	40 =	0	(7c)					
Number of flueless gas fires 0														
Infilt <mark>ration</mark> due to chimne	ys, flues and fans = $(6a)+(6b)+(6b)$	7a)+(7b)+((7c) =		20		÷ (5) =	0.1	(8)					
	een carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			_ 					
Number of storeys in the Additional infiltration	ne dweiling (ns)					[(9)]	-1]x0.1 =	0	(9) (10)					
	.25 for steel or timber frame of	r 0.35 fo	r masoni	rv consti	ruction	[(0)	1]X0.1 =	0	(11)					
	resent, use the value corresponding			•					` ′					
deducting areas of opening	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or () 1 (coal	ad) also	ontor O					(42)					
If no draught lobby, en	,). I (Seal	eu), eise	enter 0				0	(12)					
• ,	s and doors draught stripped							0	(14)					
Window infiltration	3 11		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)					
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)					
•	q50, expressed in cubic metr	-	•	•	etre of e	envelope	area	5	(17)					
·	ity value, then $(18) = [(17) \div 20] +$							0.35	(18)					
Air permeability value applie Number of sides sheltere	s if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			(19)					
Shelter factor	·u		(20) = 1 -	[0.075 x (19)] =			0.85	(20)					
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (20) =				0.3	(21)					
Infiltration rate modified for	or monthly wind speed													
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Monthly average wind sp	eed from Table 7													
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7							
Wind Factor (22a)m = (22	2\m ÷ 4													
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]						
, ,	1 1 2 3.00	1		<u> </u>	1			J						

Adjusted infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.38	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
Calculate effec		-	rate for t	he appli	cable ca	se	l				!		
If mechanica												0	(23
If exhaust air he) = (23a)			0	(23
If balanced with		•	•	_								0	(23
a) If balance		i				<u> </u>		ŕ	, 		``	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech		entilation	without	heat rec	overy (N	ЛV) (24b	p)m = (22)	r ´ `	- 		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					.5 × (23b	o)		_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n				•	•				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		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	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. Heat losse	s and he	eat loss i	naramet	or.								_	_
ELEMENT	Gros area	ss	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U	K)	k-value		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1	=	2.4	ń.			(26
Vin <mark>dows</mark> Type	1				1.24	x1	/[1/(1.4)+	0.04] =	1.64	Ħ			(27
Vindows Type	2				8.8	x1.	/[1/(1.4)+	0.04] =	11.67	Ħ			(27
Vindows Type					4.12	x1	/[1/(1.4)+	0.04] =	5.46	4			(27
Valls Type1	31.8	8	12.9	<u> </u>	18.88	_	0.18		3.4	╡ ┌			(29
Valls Type2	18.7		1.24	=	17.51	=	0.18	- -	3.15	-		╡	(29
Valls Type3		_		_				╡ ゙					
Valls Type3	11.		2.4		8.7	×	0.18	=	1.57	- 		╡	(29
	2.4		0		2.4	×	0.18	=	0.43				(29
otal area of e			effo odivo vvi	ndow II ve	64.05		formula 1	/[/4/	·a) · 0 041 ·	a airan in	naraaranl		(3
for windows and * include the area						ateu usirig	i ioiiiiuia i	/[(1/ U- vait	1 0)+0.04] a	as giveri iri	paragrapi	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				29.72	2 (33
leat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	664.8	6 (34
hermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.2	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			32.92	2 (37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 37.53	37.35	37.16	36.32	36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38
leat transfer o	coefficie	nt. W/K	•		•		•	(39)m	= (37) + (38)m	•	•	
39)m= 70.45	70.27	70.09	69.24	69.08	68.35	68.35	68.21	68.63	69.08	69.4	69.74		
10.70								i					

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) (40)m= 1.06 1.06 1.06 1.05 1.04 1.03 1.03 1.03 1.04 1.04 1.05 1.05													
		 		1.04	1.03	1.03	1.03	· ` ′	·	· ·	1.05		
(10)										Sum(40) ₁		1.05	(40)
Number of day	s in mo	nth (Tab	le 1a)							()			`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
						!	Į.		·				
1 Motor boot	ina ono	ravi koani	romont								Is\A/b/y	20KI	
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		15		(42)
Annual averag	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		5.3		(43)
not more that 125	litres per	person per	day (all w	ater use, i	not and co	ia)		,		·			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
					400 1//	_	- (aaa			m(44) ₁₁₂ =		1023.65	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x L	01m/3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		_
If instantaneous w	ator booti	ng at paint	of upo (no	hot water	, otorogol	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =		1342.17	(45)
If instantaneous w						_							
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage Storage volum		includin	na any sa	olar or M	/M/HRS	storage	within s	ame ves	ച		450		(47)
	,							airie ves	361		150		(47)
If community h Otherwise if no	_			_				ers) ente	er'∩'in (47)			
Water storage		not wate	, (tillo li	1014465 1	notantai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	cro, crit	31 0 111 ((77)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b		`	• /					54		(49)
Energy lost fro				ear			(48) x (49)) =			75		(50)
b) If manufact		_	-		or is not		(10)11(10)	,		<u> </u>	73		(00)
Hot water stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If community h	_		on 4.3										
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
•	Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m												
(modified by								<u> </u>		'	<u> </u>		
(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 calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	185.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		(62)
Solar Di	-IW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	v) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	185.75	163.79	172.18	154.58	151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		_
		-				-	-	Οι	itput from w	ater heate	r (annual) ₁	12	1890.79	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	83.54	74.14	79.03	72.48	72.21	66.22	65.21	69.33	68.51	75.08	77.34	82.08		(65)
inclu	ıde (57)	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelling	g or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 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=	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59		(66)
Ligh <mark>tin</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	16.82	14.94	12.15	9.2	6.88	5.81	6.27	8.15	10.94	13.9	16.22	17.29		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	188.39	190.35	185.42	174.93	161.69	149.25	140.94	138.98	143.91	154.4	167.64	180.08		(68)
Cookir	ng gains	(calcula	ted in A	opendix	L, equat	tion L15	or L15a)	, also	see Table	5		-		
(69)m=	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76		(69)
Pumps	and fai	ns gains	(Table 5	<u></u> Ба)									•	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)							•	
(71)m=	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07		(71)
Water	heating	gains (T	able 5)			•			•					
(72)m=	112.29	110.32	106.23	100.67	97.05	91.97	87.65	93.18	95.15	100.91	107.41	110.33		(72)
Total i	nternal	gains =	:			(66)	m + (67)m	+ (68)m	n + (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	375.78	373.89	362.08	343.07	323.9	305.3	293.13	298.6	308.28	327.48	349.54	365.97		(73)
6. So	lar gains	S:								•				
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		Access F		Area		Flu			g_ Table 65	_	FF		Gains	
	_	Table 6d		m²			ole 6a	. <u> </u>	Table 6b		able 6c		(W)	_
North	0.9x	0.77	X	8.8	3	x 1	0.63	х	0.63	x	0.7	=	28.6	(74)
North	0.9x	0.77	х	4.1	2	x 1	0.63	x	0.63	x	0.7	=	13.39	(74)
North	0.9x	0.77	х	8.8	3	x 2	0.32	x	0.63	x	0.7	=	54.65	(74)
North	0.9x	0.77	X	4.1	2	x 2	0.32	X	0.63	x	0.7	=	25.59	(74)

	_					,			,			_					_
North	0.9x	0.77		K	8.8	X	3	4.53	X		0.63	×	0.7	=		92.87	(74)
North	0.9x	0.77	:	K	4.12	X	3	34.53	X		0.63	X	0.7	=		43.48	(74)
North	0.9x	0.77		K	8.8	X	5	5.46	X		0.63	X	0.7	=		149.17	(74)
North	0.9x	0.77	:	Κ	4.12	X	5	5.46	X		0.63	X	0.7	=		69.84	(74)
North	0.9x	0.77		Κ	8.8	X	7	4.72	X		0.63	X	0.7	=		200.94	(74)
North	0.9x	0.77		Κ	4.12	X	7	4.72	X		0.63	X	0.7	=		94.08	(74)
North	0.9x	0.77		ĸ	8.8	x	7	9.99	X		0.63	X	0.7	=		215.11	(74)
North	0.9x	0.77		K	4.12	X	7	9.99	X		0.63	X	0.7	=		100.71	(74)
North	0.9x	0.77		K	8.8	X	7	4.68	X		0.63	X	0.7	=		200.83	(74)
North	0.9x	0.77		ĸ	4.12	X	7	4.68	X		0.63	X	0.7	=		94.03	(74)
North	0.9x	0.77		K	8.8	X	5	9.25	X		0.63	X	0.7	=		159.34	(74)
North	0.9x	0.77		κ	4.12	x	5	9.25	x		0.63	X	0.7	=		74.6	(74)
North	0.9x	0.77		ĸ	8.8	x	4	1.52	x		0.63	X	0.7	=		111.65	(74)
North	0.9x	0.77		κ	4.12	x	4	1.52	X		0.63	X	0.7	=		52.27	(74)
North	0.9x	0.77		κ	8.8	x	2	4.19	X		0.63	X	0.7	=		65.05	(74)
North	0.9x	0.77		ζ	4.12	x	2	4.19	x		0.63	X	0.7			30.46	(74)
North	0.9x	0.77		κ	8.8	x	1	3.12	X		0.63	X	0.7	=		35.28	(74)
North	0.9x	0.77		K	4.12	X	1	3.12	Х		0.63	X	0.7	=		16.52	(74)
North	0.9x	0.77		ĸ	8.8	х		3.86	x		0.63	X	0.7	=		23.84	(74)
North	0.9x	0.77		ĸ	4.12	х		8.86	x		0.63	Х	0.7	=		11.16	(74)
West	0.9x	0.77		ĸ	1.24	X	1	9.64	X		0.63	X	0.7	=		7.44	(80)
West	0.9x	0.77		ĸ	1.24	x	3	8.42	Х		0.63	X	0.7			14.56	(80)
West	0.9x	0.77	7 :	ĸ	1.24	×	6	3.27	х		0.63	х	0.7	_ =	Г	23.98	(80)
West	0.9x	0.77		ĸ	1.24	×	9	2.28	x		0.63	х	0.7	 =		34.97	(80)
West	0.9x	0.77		κ	1.24	x	1	13.09	x		0.63	x	0.7	_ =	Г	42.86	(80)
West	0.9x	0.77		κ .	1.24	x	1	15.77	x		0.63	x	0.7	<u> </u>		43.87	(80)
West	0.9x	0.77		κ	1.24	x	1	10.22	x		0.63	x	0.7	<u> </u>		41.77	(80)
West	0.9x	0.77	=	ζ .	1.24	x	9	4.68	x		0.63	x	0.7	<u> </u>		35.88	(80)
West	0.9x	0.77		κ	1.24	x	7	3.59	x		0.63	x	0.7	<u> </u>		27.89	(80)
West	0.9x	0.77		κ	1.24	×	4	5.59	x		0.63	X	0.7	=		17.28	(80)
West	0.9x	0.77		κ	1.24	X	2	4.49	x		0.63	×	0.7		T	9.28	(80)
West	0.9x	0.77		ζ	1.24	x	1	6.15	x		0.63	x	0.7	=		6.12	(80)
	_			•		-											
Solar	gains in	watts, ca	lculate	d	for each mon	th			(83)m	ı = Su	m(74)m .	(82)n	1		_		
(83)m=	49.43	94.8	160.32	Ι	253.97 337.8	7	359.7	336.63	269	.81	191.82	112.7	79 61.08	41.12			(83)
Total g	ains – ii	nternal a	nd sola	ar ((84)m = (73) r	n + ((83)m	, watts							_		
(84)m=	425.21	468.68	522.4		597.05 661.7	8	665	629.77	568	.41	500.1	440.2	27 410.62	407.1			(84)
7. Me	7. Mean internal temperature (heating season)																
Temp	erature	during he	eating	ре	eriods in the I	iving	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for ga	ins fo	· liv	ving area, h1	,m (s	see Ta	ble 9a)									
	Jan	Feb	Mar	\int	Apr Ma	у	Jun	Jul	A	ug	Sep	Oc	t Nov	Dec			
(86)m=	1	0.99	0.99	\int	0.95 0.83		0.63	0.47	0.5	54	0.82	0.97	0.99	1			(86)

Moon i	ntornal t	ompor	atura in	livina or	22 T1 (fa	allow eta	nc 2 to 7	7 in Tabl	o ()o)					
		20.04	20.28	20.61	20.87	ollow ste	21	20.99	20.91	20.58	20.2	10.0		(87)
` ′ L		Į				dwelling			ļ	20.58	20.2	19.9		(67)
· · · -		20.03	20.04	20.05	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04		(88)
` ′ _	!_					h2,m (se							I	,
(89)m=	1	0.99	0.98	0.93	0.78	0.55	0.37	0.44	0.75	0.96	0.99	1		(89)
_		!				l							I	. ,
						ng T2 (fo					10.01	10.50	1	(00)
(90)m=	18.59	18.77	19.11	19.59	19.92	20.04	20.06	20.06	19.98	19.56	19.01	18.56		(90)
									'	LA = LIVIN	g area ÷ (4	+) =	0.41	(91)
Mean i	nternal t	empera	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.13	19.29	19.59	20.01	20.31	20.43	20.44	20.44	20.36	19.98	19.49	19.11		(92)
Apply a	adjustme	ent to th	ne mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate		•		
(93)m=	19.13	19.29	19.59	20.01	20.31	20.43	20.44	20.44	20.36	19.98	19.49	19.11		(93)
8. Spac	ce heatir	ng requ	iirement											
Set Ti t	to the m	ean inte	ernal ter	nperatui	re obtair	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utili	isation fa	actor fo	r gains	using Ta	ble 9a								•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisati	ion facto	or for ga	ains, hm	:										
(94)m=	1	0.99	0.98	0.93	0.8	0.58	0.41	0.48	0.77	0.96	0.99	1		(94)
Useful	<mark>g</mark> ains, h	mGm ,	W = (94)	4)m x (84	4)m									
(95)m=	42 3.16	464.59	511.2	555.02	527	388.24	261.3	272.89	387.56	421.46	406.68	405.52		(95)
Monthly	y averaç	ge exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	ss rate t	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1	1044.98 1	1011.35	917.6	769.05	594.79	398.17	262.57	275.57	429.79	647.88	860.2	1039.8		(97)
Space	heating	require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		-	
(98)m=	462.64	367.42	302.36	154.1	50.43	0	0	0	0	168.46	326.53	471.9		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2303.85	(98)
Space	heating	require	ement in	kWh/m²	/year								34.78	(99)
9a. Enei	rav reau	iromon	te – Indi	vidual b	oating e	vetome i	ncluding	micro-C	'HD/					
	heating		its — Iriui	Muuai II	calling s	ysterris i	ricidaling	THICIO-C) IF)					
-	_		t from se	econdar	v/supple	mentary	svstem						0	(201)
	n of spa					,	•	(202) = 1 -	- (201) =				1	(202)
Fractio	n of tota	ıl heatir	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of ma	ain spa	ce heat	ing syste	em 1								93.5	(206)
Efficier	ncy of se	econda	ry/supple	ementar	y heatin	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	 vear
Space	heating))			<u>'</u>				,	
		367.42	302.36	154.1	50.43	0	0	0	0	168.46	326.53	471.9		
(211)m :	= {[(98)n	n x (20	4)] } x 1	00 ÷ (20	06)									(211)
ÌΓ		392.97	323.38	164.82	53.94	0	0	0	0	180.17	349.23	504.71		, ,
L					<u> </u>	I	I	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2464.02	(211)
													·	

Space heating fuel (secondary), kWh/month							
$= \{[(98)m \times (201)]\} \times 100 \div (208)$ (215)m= 0 0 0 0 0	0 0	0 0	0	0	0	1	
(215)m= 0 0 0 0 0	0 0	Total (kWh/ye				0	(215)
Water heating			,	715,1012	2	0	(210)
Output from water heater (calculated above)					_		
	35.75 130.6	143 142.64	160.28	169.19	181.36		_
Efficiency of water heater			1		i	79.8	(216)
` '	79.8 79.8	79.8 79.8	84.95	86.54	87.25		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m							
	70.11 163.66	179.19 178.75	188.69	195.51	207.86		
		Total = Sum(2	(19a) ₁₁₂ =		-	2251.6	(219)
Annual totals			k\	Wh/year	•	kWh/yea	<u>'</u>
Space heating fuel used, main system 1						2464.02	╣
Water heating fuel used						2251.6	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(230c)
boiler with a fan-assisted flue					45		(230e)
Total electricity for the above, kWh/year		sum of (230a)	(230g) =			75	(231)
Electricity for lighting						297.09	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				5087.7	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Energy		Fmiss	ion fac	tor	Emissions	
	kWh/year		kg CO			kg CO2/ye	
Space heating (main system 1)	(211) x		0.2	16	=	532.23	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	486.35	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1018.57	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	38.93	(267)
Electricity for lighting	(232) x		0.5	19	=	154.19	(268)
Total CO2, kg/year		sum o	of (265)(2	271) =		1211.69	(272)
TER =						18.29	(273)

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

67 m² Floor 0 3 m

27.3 m² (fraction 0.407) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:		Argon:	Frame:
DOO	R	Manufactur	er Solid				Wood
Ε		Manufactur	er Windows	low-E, En =	= 0.0 <mark>5, soft</mark> coat	No	
S		Manufactur	er Windows	low-E, En	= 0.05, soft coat	No	
Balco	ony	Manufactur	er Windows	low-E, En =	= 0.05, soft coat	No	

Storey height:

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
E		E	East	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
S	31.65	10.24	21.41	0.15	0	False	N/A
E	2.3	1.44	0.86	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No

Photovoltaics: <u>Photovoltaic 1</u>

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
			Р	roperty.	Address	Sample	e 3 (Mid)				
Address :											
1. Overall dwelling dime	ensions:			Δ	- (m- 2)		Av. Ha	: au la 4 / 124 \		Value o/m	3/
Ground floor				Area	a(m²) 67	(1a) x		ight(m)	(2a) =	Volume(m	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)-	+(1d)+(1e	e)+(1r	ገ)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	ry +	other 0] = [total 0	X 4	40 =	m³ per hou	ur (6a)
Number of open flues	0	╣ + 片	0	- - - - - -	0	」] = [0	x 2	20 =	0	(6b)
Number of intermittent fa			0		0	J L			10 =		(7a)
						Ļ	0		10 =	0	╡`´
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires						0	X 4	40 =	0	(7c)
									Air ch	nanges per h	our
Infiltration due to chimne	evs. flues and	fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	\ __	0		÷ (5) =	0	(8)
If a pressurisation test has I						continue fr			. (5)	Ü	(``
Number of storeys in t	he dw <mark>elling</mark> (r	ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p						•	uction			0	(11)
deducting areas of open			portaing to	ine great	er wan are	a (anter					
If suspended wooden	floor, enter 0.	2 (unseal	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window	s and doors c	lraught st	ripped		0.25 - [0.2	v (14) · 1	001 -			0	(14)
Window infiltration Infiltration rate					•	, ,	00] = (2) + (13) -	+ (15) -		0	(15)
Air permeability value,	a50 express	ed in cub	ic metre	es ner ho					area	3	(16)
If based on air permeabi				•		•	0110 01 0	птоюро	aroa	0.15	(18)
Air permeability value appli	•						is being us	sed		00	(` '
Number of sides sheltered	ed									2	(19)
Shelter factor					(20) = 1 -	`	[9)] =			0.85	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	<u> </u>	· ·			Ι ,			T		1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp		1	2.0	20	0.7	4	4.0	4.5	4.7	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (2	22)m ÷ 4										
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effect		•	rate for t	he appli	cable ca	se		ı			!		
If mechanica			l' N. (0	al.) (aa	\ - /			. (00)) (OO)			0.5	(238
If exhaust air h									o) = (23a)			0.5	(23h
If balanced with		•	•	_								79.05	(230
a) If balance	ı —					<u> </u>	- 	í `	- 		- ` 	i ÷ 100] I	(24
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24a
b) If balance	i						- ^ ` ` 	ŕ	 		Ι ,	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h				•					.5 × (23b)	_	•	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n					•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and he	eat loss i	paramete	er:							_	_	
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.4	x	1.4	=	3.36				(26)
Win <mark>dows</mark> Type	1				1.44	X	1/[1/(1)+	0.04] =	1.38	Ħ			(27)
Windows Type	2				5.44	X	1/[1/(1)+	0.04] =	5.23	Ħ			(27)
Windows Type	3				4.8	×	1/[1/(1)+	0.04] =	4.62	5			(27)
Walls Type1	31.6	35	10.24	4	21.41	X	0.15		3.21	<u> </u>		$\neg \vdash$	(29)
Walls Type2	2.3	3	1.44		0.86	X	0.15		0.13	=		7 H	(29)
Walls Type3	11.	1	2.4		8.7	X	0.15	=	1.3	F i		-	(29)
Walls Type4	2.4		0	=	2.4	x	0.35	=	0.84	=		-	(29)
Total area of e					47.45								(31)
* for windows and			effective wi	ndow U-va			formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragraph	1 3.2	(-)
** include the area	as on both	sides of ir	nternal wal	ls and par	titions								
Fabric heat los		,	U)				(26)(30)) + (32) =				20.07	(33)
Heat capacity		` ,						((28).	(30) + (32	2) + (32a).	(32e) =	467.18	(34)
Thermal mass	•	,		,					tive Value			250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	indicative	e values of	TMP in T	able 1f		
Thermal bridge					-	<						7.12	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) ±	· (36) =			07.40	(37)
Ventilation hea		alculated	monthly	,					= 0.33 × (25)m × (5)	27.19	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m= 17.73	17.52	17.31	16.25	16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer of	<u> </u>		I		l		L	<u> </u>			1	J	、
(39)m= 44.92	44.71	44.5	43.44	43.23	42.17	42.17	41.96	42.6	43.23	43.65	44.08	l	

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.67	0.67	0.66	0.65	0.65	0.63	0.63	0.63	0.64	0.65	0.65	0.66		
Numbe	or of day	e in moi	nth (Tab	lo 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.65	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
												<u> </u>		
4. Wa	iter heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		17		(42)
Reduce	the annua	al average		usage by	5% if the d	welling is	designed t	(25 x N) to achieve		se target o		5.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			1			
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		—
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1029.18	(44)
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
										Γotal = Su	m(45) ₁₁₂ =		1349.41	(45)
								boxes (46,						(40)
(46)m= Water	20.99 storage	18.35 loss:	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	_		includir	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	ınd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
,			m Table			(.,, , .					0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
•			eclared o	-										
		_	factor free section		e 2 (KVVI	n/litre/da	ıy)				0.	.02		(51)
	•	from Ta		JII 4.0							1.	.03		(52)
Tempe	rature fa	actor fro	m Table	2b							—	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	.03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	m Table	3							0		(58)
	•				,	•	. ,	65 × (41)						
•							ı —	ng and a			<u> </u>			(50)
(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 calculated for each	month (61) m = (60))) ÷ 365 x (41)m			
(61)m= 0 0 0	0 0	0 0 0	0 0	0 0	(61)
Total heat required for water he	eating calculated fo	r each month (62)m	$= 0.85 \times (45) \text{m} +$	(46)m + (57)m +	· (59)m + (61)m
(62)m= 195.18 172.29 181.54	163.58 160.9 14	44.64 139.74 152.	2 151.57 169.58	178.26 190.77	(62)
Solar DHW input calculated using Appe	endix G or Appendix H ((negative quantity) (ente	'0' if no solar contribu	tion to water heating)	•
(add additional lines if FGHRS	and/or WWHRS ap	oplies, see Appendi	(G)		_
(63)m= 0 0 0	0 0	0 0 0	0 0	0 0	(63)
FHRS 18.03 16.04 16.49	14.58 14.03 1	2.18 11.28 12.9	13.08 15.09	16.32 17.54	(63) (G2)
Output from water heater					_
(64)m= 174.47 153.83 162.37	146.4 144.19 12	29.86 125.78 136.5	8 135.89 151.81	159.35 170.55	
		C	utput from water heate	er (annual) ₁₁₂	1791.08 (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	<u> </u>
(65)m= 90.74 80.63 86.21	79.4 79.34 7	73.1 72.31 76.4	5 75.41 82.23	84.28 89.27	(65)
include (57)m in calculation of	of (65)m only if cylin	nder is in the dwellir	g or hot water is f	rom community h	neating
5. Internal gains (see Table 5	and 5a):				
Metabolic gains (Table 5), Watt	ts				_
Jan Feb Mar	Apr May	Jun Jul Au	Sep Oct	Nov Dec	
(66)m= 108.56 108.56 108.56	108.56 108.56 10	08.56 108.56 108.5	6 108.56 108.56	108.56 108.56	(66)
Ligh <mark>ting gains (calculated in Ap</mark>	pendix L, equation	L9 or L9a), also se	e Table 5		
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6. <mark>66</mark> 8.66	11.62 14.75	17.22 18.36	(67)
Appliances gains (calculated in	Appendix L, equat	tion L13 <mark>or L13</mark> a), a	so see Table 5		
(68)m= 190.2 192.17 187.2	176.61 163.24 15	50.68 142.29 140.3	2 145.29 155.88	169.24 181.8	(68)
Cooking gains (calculated in Ap	ppendix L, equation	L15 or L15a), also	see Table 5		•
(69)m= 33.86 33.86 33.86	33.86 33.86 3	33.86 33.86 33.8	33.86 33.86	33.86 33.86	(69)
Pumps and fans gains (Table 5	5a)	•	•	•	
(70)m= 0 0 0	0 0	0 0 0	0 0	0 0	(70)
Losses e.g. evaporation (negat	tive values) (Table :	5)	•	•	•
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85 -8	86.85 -86.85 -86.8	5 -86.85 -86.85	-86.85 -86.85	(71)
Water heating gains (Table 5)			•	•	•
(72)m= 121.96 119.98 115.87	110.27 106.64 10	01.53 97.18 102.7	5 104.73 110.52	117.06 119.99	(72)
Total internal gains =		(66)m + (67)m + (68)	m + (69)m + (70)m + (7	71)m + (72)m	,
(73)m= 385.59 383.58 371.53	352.22 332.75 3	13.94 301.7 307.2	9 317.21 336.72	359.09 375.72	(73)
6. Solar gains:					
Solar gains are calculated using solar	r flux from Table 6a and	associated equations to	convert to the applica	ble orientation.	
Orientation: Access Factor	Area	Flux	g_ 	FF	Gains
Table 6d	m²	Table 6a	Table 6b T	able 6c	(W)
East 0.9x 0.77 x	1.44 ×	19.64 X	0.4 ×	0.7 =	5.49 (76)
East 0.9x 0.77 x	1.44 ×	38.42 X	0.4 ×	0.7 =	10.74 (76)
East 0.9x 0.77 x	1.44 ×	63.27 ×	0.4 ×	0.7	17.68 (76)
East 0.9x 0.77 x	1.44 ×	92.28 ×	0.4 ×	0.7	25.78 (76)

East 0.9x 0.77 x 1.44 x 113.09 x 0.4 x 0.7 = 31.6 East 0.9x 0.77 x 1.44 x 115.77 x 0.4 x 0.7 = 32.35 East 0.9x 0.77 x 1.44 x 110.22 x 0.4 x 0.7 = 30.8 East 0.9x 0.77 x 1.44 x 94.68 x 0.4 x 0.7 = 26.45 East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74 East 0.9x 0.77 x 1.44 x 24.49 x 0.4 x 0.7 = 6.84	
East 0.9x 0.77 x 1.44 x 110.22 x 0.4 x 0.7 = 30.8 East 0.9x 0.77 x 1.44 x 94.68 x 0.4 x 0.7 = 26.45 East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	(76) (76) (76)
East 0.9x 0.77 x 1.44 x 94.68 x 0.4 x 0.7 = 26.45 East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	(76) (76)
East 0.9x 0.77 x 1.44 x 73.59 x 0.4 x 0.7 = 20.56 East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	(76)
East 0.9x 0.77 x 1.44 x 45.59 x 0.4 x 0.7 = 12.74	╡゛゛
515A 515	1(76)
East $0.9x \mid 0.77 \mid x \mid 1.44 \mid x \mid 24.49 \mid x \mid 0.4 \mid x \mid 0.7 \mid = 1 6.84$	╡`′
	<u> </u> (76)
East 0.9x 0.77 x 1.44 x 16.15 x 0.4 x 0.7 = 4.51	<u></u> (76)
South 0.9x 0.77 x 5.44 x 46.75 x 0.4 x 0.7 = 49.35	<u> </u> (78)
South 0.9x 0.77 x 4.8 x 46.75 x 0.4 x 0.7 = 43.54	<u> </u> (78)
South 0.9x 0.77 x 5.44 x 76.57 x 0.4 x 0.7 = 80.82	(78)
South 0.9x 0.77 x 4.8 x 76.57 x 0.4 x 0.7 = 71.31	(78)
South 0.9x 0.77 x 5.44 x 97.53 x 0.4 x 0.7 = 102.95	(78)
South 0.9x 0.77 x 4.8 x 97.53 x 0.4 x 0.7 = 90.84	(78)
South 0.9x 0.77 x 5.44 x 110.23 x 0.4 x 0.7 = 116.36	(78)
South 0.9x 0.77 x 4.8 x 110.23 x 0.4 x 0.7 = 102.67	(78)
South 0.9x 0.77 x 5.44 x 114.87 x 0.4 x 0.7 = 121.26	(78)
South 0.9x 0.77 x 4.8 x 114.87 x 0.4 x 0.7 = 106.99	(78)
South 0.9x 0.77 x 5.44 x 110.55 x 0.4 x 0.7 = 116.69	(78)
South 0.9x 0.77 x 4.8 x 110.55 x 0.4 x 0.7 = 102.96	(78)
South 0.9x 0.77 x 5.44 x 108.01 x 0.4 x 0.7 = 114.01	(78)
South 0.9x 0.77 x 4.8 x 108.01 x 0.4 x 0.7 = 100.6	(78)
South 0.9x 0.77 x 5.44 x 104.89 x 0.4 x 0.7 = 110.72	(78)
South 0.9x 0.77 x 4.8 x 104.89 x 0.4 x 0.7 = 97.7	(78)
South 0.9x 0.77 x 5.44 x 101.89 x 0.4 x 0.7 = 107.55	(78)
South 0.9x 0.77 x 4.8 x 101.89 x 0.4 x 0.7 = 94.9	(78)
South 0.9x 0.77 x 5.44 x 82.59 x 0.4 x 0.7 = 87.18	(78)
South 0.9x 0.77 x 4.8 x 82.59 x 0.4 x 0.7 = 76.92	(78)
South 0.9x 0.77 x 5.44 x 55.42 x 0.4 x 0.7 = 58.5	– (78)
South 0.9x 0.77 x 4.8 x 55.42 x 0.4 x 0.7 = 51.62	(78)
South 0.9x 0.77 x 5.44 x 40.4 x 0.4 x 0.7 = 42.64	(78)
South 0.9x 0.77 x 4.8 x 40.4 x 0.4 x 0.7 = 37.63	(78)
0.17	
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 98.38 162.87 211.48 244.82 259.85 252 245.41 234.88 223.01 176.83 116.95 84.78	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 483.97 546.46 583.01 597.03 592.6 565.95 547.11 542.17 540.21 513.55 476.04 460.5	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(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= 0.99 0.97 0.93 0.83 0.67 0.48 0.34 0.36 0.54 0.82 0.97 0.99	(86)
	,

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)									
(87)m= 20.58 20.71 20.84 20.95 20.99 21 21 21 21 20.96 20.77 20.56	1	(87)							
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	,								
(88)m= 20.37 20.37 20.37 20.39 20.39 20.4 20.4 20.41 20.4 20.39 20.38 20.38]	(88)							
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	•								
(89)m= 0.99 0.96 0.91 0.8 0.63 0.43 0.29 0.31 0.5 0.79 0.96 0.99]	(89)							
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	•								
(90)m= 19.82 20 20.18 20.33 20.38 20.4 20.4 20.41 20.4 20.35 20.1 19.8]	(90)							
fLA = Living area ÷ (4) =	0.41	(91)							
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		•							
(92)m= 20.13 20.29 20.45 20.58 20.63 20.65 20.65 20.65 20.64 20.6 20.38 20.11]	(92)							
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_								
(93)m= 20.13 20.29 20.45 20.58 20.63 20.65 20.65 20.65 20.64 20.6 20.38 20.11]	(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-calc the utilisation factor for gains using Table 9a	culate								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec									
Utilisation factor for gains, hm:	,								
(94)m= 0.98 0.96 0.91 0.81 0.64 0.45 0.31 0.33 0.51 0.8 0.96 0.99		(94)							
Useful gains, hmGm , W = (94)m x (84)m	1	(05)							
(95)m= 476.34 525.75 533.03 481.35 381.93 254.81 170.65 178.25 278.11 411.13 455.33 455	J	(95)							
Monthly average external temperature from Table 8	1	(06)							
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	J	(96)							
Heat loss rate for mean internal temperature, Lm, W = [(39)m x [(93)m - (96)m] (97)m = 711.05 687.98 620.71 507.6 386.06 254.99 170.66 178.26 278.67 432.16 579.55 701.23	1	(97)							
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$]	(0.)							
(98)m= 174.63 109.02 65.23 18.9 3.07 0 0 0 0 15.65 89.43 183.19	1								
Total per year (kWh/year) = Sum(98) _{15,912} =	659.13	(98)							
Space heating requirement in kWh/m²/year	9.84]](99)							
	3.04](00)							
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme.									
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; is all the boilers, best purpose reactions and upsets best from power stations. See Appendix C	he latter								
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump	1	(303a)							
Fraction of total space heat from Community heat pump (302) x (303a) =									
Factor for control and charging method (Table 4c(3)) for community heating system 1									
Distribution loss factor (Table 12c) for community heating system 1.05									
Space heating	kWh/year								
Annual space heating requirement	659.13								
		-							

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	692.08	(307a)
Efficiency of secondary/supplementary heating system in % (from		0	(308
Space heating requirement from secondary/supplementary systematical systems of the secondary supplementary systems.	,	0	(309)
			l` ′
Water heating Annual water heating requirement		1791.08	
If DHW from community scheme:	(64) v (2026) v (205) v (206)	4000.00	(2400)
Water heat from Community heat pump	$(64) \times (303a) \times (305) \times (306) =$	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e		(313)
Cooling System Energy Efficiency Ratio	(407) + (244)	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from a	outside	119.54	(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) =	119.54	(331)
Energy for lighting (calculated in Appendix L)		315.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (332)(237b) =	2489.53	(338)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission fac		
		tor Emiss <mark>ions</mark> kg CO2/vear	
CO2 from other sources of space and water heating (not CHP)	kWh/year kg CO2/kWh	kg CO <mark>2/yea</mark> r	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using		kg CO <mark>2/ye</mark> ar	(367a)
Efficiency of heat source 1 (%) If there is CHP using	kWh/year kg CO2/kWh	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second	kg CO2/year	
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year kg CO2/kWh y two fuels repeat (363) to (366) for the second (310b)] x 100 ÷ (367b) x 0.52	kg CO2/year d fuel 256 = 521.58	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh 1 two fuels repeat (363) to (366) for the second (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52	kg CO2/year d fuel 256 = 521.58 = 13.35	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh 1 two fuels repeat (363) to (366) for the second 1310b)] x 100 ÷ (367b) x 1310b)] x 100 ÷ (367b) x 1310b) x 100 ÷ (367b) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 1310b) x 100 ÷ (368) x 13	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous	kWh/year kg CO2/kWh y two fuels repeat (363) to (366) for the second (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x 0	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous	kWh/year kg CO2/kWh y two fuels repeat (363) to (366) for the second (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 ous heater (312) x 0.22	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0 = 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh y two fuels repeat (363) to (366) for the second (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x 0 ous heater (312) x (373) + (374) + (375) =	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0 = 0 534.93	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh 13 two fuels repeat (363) to (366) for the second 13 (310b)] x 100 ÷ (367b) x 13 (313) x 14 (363)(366) + (368)(372) 15 (309) x 16 (312) x 17 (373) + (374) + (375) = 18 (331)) x 18 (332))) x 19 (352)	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0 = 0 534.93 = 62.04 = 163.72	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantanee Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwellin CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application	kWh/year kg CO2/kWh 1 two fuels repeat (363) to (366) for the second 310b)] x 100 ÷ (367b) x	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0 = 0 534.93 = 62.04 = 163.72	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1	kWh/year kg CO2/kWh 1 two fuels repeat (363) to (366) for the second 310b)] x 100 ÷ (367b) x	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0 = 0 534.93 = 62.04 = 163.72	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application Total CO2, kg/year sum of (376)(382) =	kWh/year kg CO2/kWh 1 two fuels repeat (363) to (366) for the second 310b)] x 100 ÷ (367b) x	kg CO2/year d fuel 256 = 521.58 = 13.35 = 534.93 = 0 = 0 534.93 = 62.04 = 163.72	(367) (372) (373) (374) (375) (376) (378) (379) (380) (383)

			User [Details:						
Assessor Name: Software Name:	Stroma Number: Stroma FSAP 2012 Software Version: Version									
		Р	roperty	Address	: Sampl	e 3 (Mid)			
Address :										
1. Overall dwelling dimer	nsions:		A	- (2\		A., 11a	! a.l. 4/.a.\		Value of m	2)
Ground floor			Are	a(m²) 67	(1a) x	Av. ne	gight(m)	(2a) =	Volume(m	3) (3a
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)-	+(1e)+(1r	ገ)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating + 0	ry □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	.ır (6a
·			_]		=	20 =		╡`
Number of open flues	0	0	」 ' L	0] ⁻	0			0	(6b)
Number of intermittent far	1S				Ĺ	2		10 =	20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fir	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimney	rs flues and fans	- (6a)+(6b)+(7	7a)+(7b)+((7c) =	Г	20	_	÷ (5) =		(8)
If a pressurisation test has be					continue f	20 from (9) to		÷ (5) =	0.1	(6)
Number of storeys in th	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11
if both types of wall are pre deducting areas of opening			the grea	ter wall are	a (atter					
If suspended wooden fl			.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, enter	er 0.05, else ente	r 0							0	(13
Percentage of windows	and doors draug	ht stripped							0	(14
Window infiltration				0.25 - [0.2	. ,				0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, or If based on air permeability	•		•	•	•	netre of e	envelope	area	5	(17
Air permeability value applies	-					is beina u	ısed		0.35	(18
Number of sides sheltered				g. 00 a po					2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wind sp	peed							_	
Jan Feb	Mar Apr M	1ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m (22)m : 1									
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25 1	' 	08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(224)111- 1.21 1.20 1	.20 1.1 1.0	0.95	0.95	1 0.32	<u> </u>	1.00	1.12	1.10	J	

Adjusted 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	0.27	0.3	0.32	0.33	0.35]	
Calculate effect		•	rate for t	he appli	cable ca	se	l	l	!				
If mechanica												0	(23
If exhaust air h									o) = (23a)			0	(23
If balanced with		•	•	_								0	(23
a) If balance		anical ve				ery (MVI		ŕ	2b)m + (- 	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	entilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h if (22b)n				-	-				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n				•	•				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]	(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) 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 losse	ond be	ot loss i	ooromet	or:									
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
Doors					2.4	x	1	_ =	2.4	$\stackrel{\prime}{\Box}$			(26
Vin <mark>dows</mark> Type	1				1.44	x1,	/[1/(1.4)+	0.04] =	1.91	Ħ			(27
Vindows Type					5.44		/[1/(1.4)+		7.21	Ħ			(27
Vindows Type	: 3				4.8	х1	/[1/(1.4)+	0.04] =	6.36				(27
Valls Type1	31.6	35	10.2	4	21.41	X	0.18	=	3.85				(29
Valls Type2	2.3	3	1.44		0.86	X	0.18	=	0.15				(29
Walls Type3	11.	1	2.4		8.7	X	0.18	=	1.57				(29
Valls Type4	2.4		0		2.4	х	0.18		0.43				(29
otal area of e	lements	, m²			47.45	<u>=</u>							(31
for windows and * include the area						ated using	ı formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragrapl	3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				23.89	9 (33
leat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	467.1	8 (34
hermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250	(35
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						2.37	(30
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	· (36) =			26.20	6 (37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 37.92	37.74	37.56	36.71	36.55	35.81	35.81	35.67	36.09	36.55	36.87	37.21	1	(38
 leat transfer o	oefficie	nt. W/K					•	(39)m	= (37) + (38)m	•		
39)m= 64.19	64	63.82	62.97	62.81	62.07	62.07	61.93	62.36	62.81	63.13	63.47	1	
	1				ı	i	I	L	1	L	1		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.96	0.96	0.95	0.94	0.94	0.93	0.93	0.92	0.93	0.94	0.94	0.95		
								,	Average =	Sum(40) ₁ .	12 /12=	0.94	(40)
Number 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. Water heat	ing enei	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	pancy, l	N								2.	17		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13	.9)			
Annual averag	•	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		85	.76		(43)
Reduce the annua	_		• .		-	-	ò achieve	a water us	se target o		-		, ,
not more that 125	litres per j	person per	day (all w	ater use, I	not and co	la)			1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	i litres per	day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		_
Francis acutant of	la a fi viva fa u			a satlali . A	400 \/ -1		T / 2000			m(44) ₁₁₂ =		1029.18	(44)
Energy content of	not water	usea - cai				n x nm x L	01m / 360C	KVVn/mor	· ·		c, 1a)		
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous w	ater heatii	ng at noint	of use (no	hot water	storage)	enter () in	hoves (46)		Total = Su	m(45) ₁₁₂ =	<u> </u>	1349.41	(45)
									47.45	10.70	00.00		(46)
(46)m= 20.99 Water storage	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volum		includin	anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h											100		(,
Otherwise if no	_			_				ers) ente	er '0' in ((47)			
Water storage			(-					,	,	,			
a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact	urer's de	eclared o	ylinder l	oss fact	or is not	known:							
Hot water stora	-			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3										.
Volume factor Temperature fa			2h								0		(52)
•									,		0		(53)
Energy lost fro		-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,					//>			0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m 				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	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 calculated for each	n month (61)m - (60) ÷ '	365 v (41)m			
(61)m= 0 0 0		0 0	T 0 T 0	0 0	(61)
Total heat required for water he	eating calculated for ea		 = 0.85 × (45)m +	(46)m + (57)m +	」 - (59)m + (61)m
(62)m= 186.5 164.45 172.86	155.17 152.22 136.24		143.17 160.9	169.86 182.09	(62)
Solar DHW input calculated using App	pendix G or Appendix H (nega	ative quantity) (enter ')' if no solar contribu	tion to water heating) L
(add additional lines if FGHRS					
(63)m= 0 0 0	0 0 0	0 0	0 0	0 0	(63)
FHRS 0 0 0	0 0 0	0 0	0 0	0 0	(63) (G2)
Output from water heater					
(64)m= 186.5 164.45 172.86	155.17 152.22 136.24	131.06 143.52	143.17 160.9	169.86 182.09]
		Out	put from water heate	er (annual) ₁₁₂	1898.03 (64)
Heat gains from water heating,	, kWh/month 0.25 ´ [0.8	5 × (45)m + (61)r	n] + 0.8 x [(46)m	+ (57)m + (59)m	n]
(65)m= 83.79 74.35 79.26	72.68 72.4 66.38	65.36 69.5	68.68 75.28	77.56 82.33	(65)
include (57)m in calculation	of (65)m only if cylinder	is in the dwelling	or hot water is f	rom community I	neating
5. Internal gains (see Table 5	5 and 5a):				
Metabolic gains (Table 5), Wat	tts				_
Jan Feb Mar	Apr May Jun	Jul Aug	Sep Oct	Nov Dec	
(66)m= 108.56 108.56 108.56	108.56 108.56 108.56	108.56	108.56 108.56	108.56 108.56	(66)
Lighting gains (calculated in Ap	ppendix L, equation L9	or L9a), also see	Table 5		
(67)m= 17.41 15.46 12.58	9.52 7.12 6.01	6.49 8.44	11.33 14.38	16.79 17.89	(67)
Appliances gains (calculated in	Appendix L, equation	L13 or L13a), als	o see Table 5		-
(68)m= 190.2 192.17 187.2	176.61 163.24 150.68	142.29 140.32	145.29 155.88	169.24 181.8	(68)
Cooking gains (calculated in A	ppendix L, equation L1	5 or L15a), also s	ee Table 5		-
(69)m= 33.86 33.86 33.86	33.86 33.86 33.86	33.86 33.86	33.86 33.86	33.86 33.86	(69)
Pumps and fans gains (Table 5	5a)	•		•	-
(70)m= 3 3 3	3 3 3	3 3	3 3	3 3	(70)
Losses e.g. evaporation (nega-	tive values) (Table 5)	-			-
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -86.85	-86.85 -86.85	(71)
Water heating gains (Table 5)	-	-	-		-
(72)m= 112.63 110.65 106.53	100.94 97.31 92.19	87.85 93.42	95.4 101.18	107.72 110.65	(72)
Total internal gains =	(6	6)m + (67)m + (68)m	+ (69)m + (70)m + (7	71)m + (72)m	-
(73)m= 378.8 376.85 364.87	345.64 326.23 307.45	5 295.2 300.74	310.58 330.01	352.32 368.92	(73)
6. Solar gains:					
Solar gains are calculated using sola	er flux from Table 6a and asso	ociated equations to c	onvert to the applica	ble orientation.	
Orientation: Access Factor		lux	g_ 	FF	Gains
Table 6d	m² Ta	able 6a	Гable 6b Т	able 6c	(W)
East 0.9x 0.77 x	1.44 X	19.64 ×	0.63 ×	0.7 =	8.64 (76)
East 0.9x 0.77 x	1.44 X	38.42 ×	0.63 ×	0.7 =	16.91 (76)
East 0.9x 0.77 x	1.44 X	63.27 ×	0.63 ×	0.7 =	27.85 (76)
East 0.9x 0.77 x	1.44 X	92.28 X	0.63 ×	0.7	40.61 (76)

East	0.9x	0.77	x	1.44	4	x	11	3.09	x		0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	×	1.44	4	x	11	5.77	X		0.63	x	0.7		50.95	(76)
East	0.9x	0.77	x	1.44	4	x	11	0.22	X		0.63	X	0.7	=	48.51	(76)
East	0.9x	0.77	×	1.44	4	x	94	4.68	x		0.63	X	0.7	=	41.67	(76)
East	0.9x	0.77	x	1.44	4	x	7:	3.59	x		0.63	X	0.7		32.39	(76)
East	0.9x	0.77	X	1.44	4	x	4:	5.59	x		0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	X	1.44	4	x	24	4.49	X		0.63	X	0.7	=	10.78	(76)
East	0.9x	0.77	X	1.44	4	x	10	6.15	X		0.63	X	0.7	=	7.11	(76)
South	0.9x	0.77	X	5.44	4	x	40	6.75	x		0.63	x	0.7	=	77.73	(78)
South	0.9x	0.77	X	4.8		x	40	6.75	X		0.63	X	0.7	=	68.58	(78)
South	0.9x	0.77	X	5.44	4	x	70	6.57	X		0.63	X	0.7	=	127.3	(78)
South	0.9x	0.77	X	4.8		x	70	6.57	X		0.63	X	0.7	=	112.32	(78)
South	0.9x	0.77	X	5.44	4	x	9	7.53	X		0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77	X	4.8		x	9	7.53	X		0.63	X	0.7	=	143.08	(78)
South	0.9x	0.77	X	5.44	4	x	11	0.23	X		0.63	X	0.7	=	183.27	(78)
South	0.9x	0.77	X	4.8		x	11	0.23	x		0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77	X	5.44	4	x	11	4.87	x		0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77	X	4.8		X	11	4.87	Х		0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77	X	5.44	4	x	11	0.55	x		0.63	Х	0.7	=	183.79	(78)
South	0.9x	0.77	X	4.8		x	11	0.55	X		0.63	Х	0.7	=	162.17	(78)
South	0.9x	0.77	X	5.44	4	X	10	8.01	X		0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77	X	4.8		x	10	8.01	Х		0.63	Х	0.7	=	158.45	(78)
South	0.9x	0.77	X	5.44	4	x	10	4.89	X		0.63	X	0.7	=	174.39	(78)
South	0.9x	0.77	X	4.8		х	10	04.89	X		0.63	X	0.7	=	153.87	(78)
South	0.9x	0.77	X	5.44	4	X	10	1.89	X		0.63	X	0.7	=	169.39	(78)
South	0.9x	0.77	X	4.8		X	10	1.89	X		0.63	X	0.7	=	149.46	(78)
South	0.9x	0.77	X	5.44	4	X	8:	2.59	X		0.63	X	0.7	=	137.3	(78)
South	0.9x	0.77	X	4.8		X	8:	2.59	X		0.63	X	0.7	=	121.15	(78)
South	0.9x	0.77	X	5.44	4	X	5	5.42	X		0.63	X	0.7	=	92.13	(78)
South	0.9x	0.77	X	4.8		X	5	5.42	X		0.63	X	0.7	=	81.29	(78)
South	0.9x	0.77	X	5.44	4	X	4	0.4	X		0.63	X	0.7	=	67.16	(78)
South	0.9x	0.77	X	4.8		X	4	0.4	X		0.63	X	0.7	=	59.26	(78)
•	i i	watts, calc 256.53 3	$\overline{}$	for each	409.26	_	96.91	386.53	(83)m 369		n(74)m		104.0	133.53	7	(83)
(83)m= Total o	154.95	ternal and	33.08						369	.93	351.23	278.51	184.2	133.53		(63)
(84)m=	533.75		97.95	731.22	735.49	<u> </u>	04.36	681.72	670	.67	661.81	608.52	536.52	502.45	7	(84)
									L							. ,
		nal temper					aroa f	rom Tak	olo O	Th1	(°C)				21	(85)
		during hea tor for gain	•			_			بر عار ال	, 1111	(0)				21	(00)
Otilisa	Jan		Mar	Apr	a, nn, May	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	7	
(86)m=	0.99		0.95	0.87	0.74	+	0.56	0.4	0.4	- +	0.63	0.88	0.98	0.99	1	(86)
(20)2								3	L			3.30	1 5.55	I	Т	(7)

					T4 //		o	·· - · ·	٥.					
Г	- 1		ature in		· `		i	i	· ·	00.00	00.40	00.47	1	(87)
(87)m= [20.21	20.4 during h	20.61 neating p	20.82	20.94	20.99	from Ta	21 hle 0 T	20.98 h2 (°C)	20.83	20.49	20.17		(67)
(88)m=	20.12	20.12	20.12	20.13	20.14	20.15	20.15	20.15	20.14	20.14	20.13	20.13		(88)
L			<u> </u>			<u> </u>	<u> </u>	<u> </u>						, ,
Г	1		ains for			· `	i		0.50	0.05	0.07	0.00	1	(90)
(89)m=	0.99	0.97	0.93	0.84	0.69	0.49	0.32	0.35	0.56	0.85	0.97	0.99		(89)
Mean	internal	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	19.08	19.36	19.65	19.94	20.09	20.14	20.14	20.15	20.13	19.96	19.49	19.03		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.41	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.54	19.78	20.04	20.3	20.44	20.49	20.49	20.49	20.48	20.32	19.89	19.5		(92)
Apply	adjustm	ent to t	he mean	interna	l tempera	ature fro	m Table	4e, whe	ere appro	priate	ļ			
(93)m=	19.54	19.78	20.04	20.3	20.44	20.49	20.49	20.49	20.48	20.32	19.89	19.5		(93)
8. Spa	ace heat	ing requ	uirement				ı	ı	ı	ı				
Set Ti	to the n	nean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9l	b, so tha	ıt Ti,m=(76)m an	d re-calc	ulate	
the uti	lisation	factor fo	or gains	using Ta	ble 9a								i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	tion fact	or for g	ains, hm	:										
(94)m=	0 .99	0.97	0.93	0.85	0.71	0.51	0.35	0.38	0.59	0.86	0.97	0.99		(94)
Usefu	l gains,	hmGm .	W = (94)	4)m x (8	4)m									
(95)m=	52 6.56	612.56	648.09	619.69	520.53	361.94	241.32	253.07	389.85	521.55	519.48	497.39		(95)
Month	ly avera	ige exte	rnal tem	perature	from Ta	ble 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)
г			an intern		· ·		-``	-`	- ` 					
(97)m=	978.32	952.46	864.45	717.63	548.68	365.41	241.63	253.53	397.64	610.24	807.75	971.04		(97)
	- 1		ement fo								ri e		1	
(98)m=	336.11	228.41	160.97	70.52	20.94	0	0	0	0	65.98	207.55	352.4		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1442.89	(98)
Space	e heating	g require	ement in	kWh/m²	²/year								21.54	(99)
9a. Ene	ergy reg	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
	heatin				<u> </u>	,			,					
Fraction	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
			ng from	-	, ,			(204) = (2	02) x [1 –	(203)] =			1	(204)
			ace heat	-				, , ,	, -	, ,-			93.5	(206)
	•		ry/suppl			a cycton	o 0/							(208)
Ellicie	TICY OF S					y system	1						0	
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space		•	ement (c										ı	
L	336.11	228.41	160.97	70.52	20.94	0	0	0	0	65.98	207.55	352.4		
(211)m	= {[(98)	m x (20	4)] } x 1	00 ÷ (20)6)	T							ı	(211)
	359.48	244.29	172.17	75.42	22.39	0	0	0	0	70.57	221.98	376.9		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1543.19	(211)
												•		

Space heating fuel (secondary), kWh/month = $\{[(98)\text{m x}(201)]\} \times 100 \div (208)$							
$ = \{ [(90) 11 \times (201)] \} \times 100 \div (200) $ $ (215) m = $	0 0	0 0	0	0	0		
	I	Total (kWh/y	ear) =Sum(215) _{15,101}	<u></u>	0	(215)
Water heating							_
Output from water heater (calculated above) 186.5 164.45 172.86 155.17 152.22 1	36.24 131.06	143.52 143.17	7 160.9	169.86	182.09		
Efficiency of water heater	101.00	110.02	100.0	100.00	102.00	79.8	(216)
· · · · · · · · · · · · · · · · · · ·	79.8 79.8	79.8 79.8	82.64	85.35	86.55		(217)
Fuel for water heating, kWh/month	•		•	•	•	•	
(219) m = (64) m x $100 \div (217)$ m (219)m= 215.94 191.91 204.27 187.27 188.03 1	70.73 164.23	179.84 179.4 ⁻	194.69	199.02	210.39		
	ļ	Total = Sum	(219a) ₁₁₂ =		<u>I</u>	2285.73	(219)
Annual totals			k	Wh/yea	r	kWh/yeaı	
Space heating fuel used, main system 1						1543.19	╛
Water heating fuel used						2285.73	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(2300
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year		sum of (230a	a)(230g) =	:		75	(231)
Electricity for lighting						307.48	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				4211.4	(338)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Energy kWh/year			ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x		0.2	16	=	333.33	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	493.72	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =		_		827.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	38.93	(267)
Electricity for lighting	(232) x		0.5	19	=	159.58	(268)
Total CO2, kg/year		sum	of (265)(271) =		1025.55	(272)
							٦.

TER =

(273)

15.31

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height: 67 m² Floor 0 3 m

27.3 m² (fraction 0.407) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:		Argon:	Fr	ame:
DOO	R	<u>Manufacturer</u>	Solid				Wc	ood
W		Manufacturer	Windows	low-E, $En = 0.05$	s, soft coat	No		
S		Manufacturer	Windows	low-E, En = 0.05	s, soft coat	No		
Balco	ony	Manufactur <mark>er</mark>	Windows	low-E, $En = 0.05$	s, soft coat	No		

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen	<u>ts</u>						
S	31.7	10.24	21.46	0.15	0	False	N/A
W	19	1.44	17.56	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%
Terrain type: Dense urban
EPC language: English
Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	FSAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 4 (Mid))			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (2\		Av. Ha	: a.b.4/\		Value o/m	3/
Ground floor				Area	a(m²) 67	(1a) x		ight(m)	(2a) =	Volume(m	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	ገ)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdai neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ur (6a)
Number of open flues	0	╡ + ト	0	- - - - - -	0	」	0	x :	20 =	0	(6b)
Number of intermittent fa						J [10 =		(7a)
						Ļ	0		10 =	0	╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges per h	our
Infiltration due to chimne	vs. flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has t						continue fr			. (0) =	0	
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0						•	uction			0	(11)
if both types of wall are p deducting areas of openi			ponding to	the great	er wall are	a (atter					
If suspended wooden	floor, enter ().2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, els	e enter 0								0	(13)
Percentage of window	s and doors	draught st	tripped							0	(14)
Window infiltration					•	2 x (14) ÷ 1	-			0	(15)
Infiltration rate						+ (11) + (1				0	(16)
Air permeability value,				•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabi Air permeability value applie	•						is heina u	sad		0.15	(18)
Number of sides sheltere		allon lest na	s been doi	ie or a det	gree an pe	тпеаышу	is being us	seu		2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter f	actor			(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified	or monthly v	wind speed	ł								
Jan Feb	Mar Ap	r May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	eed from Ta	able 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22-) (2	2)m · 4										
Wind Factor $(22a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m = (23a)m $		1.00	0.05	0.95	0.00	1 4	1.08	4 40	1.18	1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	l o.aa	0.92	1	I 1.08	1.12	1.18	I	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		•	rate for t	he appli	cable ca	se	!	l					
If mechanica												0.5	(23
If exhaust air h) = (23a)			0.5	(23
If balanced with		-		_								79.05	(23
a) If balance							- ´ ` -	^ `	 		- ` ´	÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	overy (I	MV) (24b	p)m = (22)	2b)m + (23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)r	ouse ex n < 0.5 ×			•	•				.5 × (23k	o)		_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r	ventilation			•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	(25)	-	-	-		
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
3. Heat losse	e and he	at lose i	naram o t	or:									
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
Doors	a. oa	()			2.4	×	1.4	= 1	3.36		,,,,,		(2
Vin <mark>dows</mark> Type	1				1.44		1/[1/(1)+	\ !	1.38	Ħ			(2
Vindows Type							1/[1/(1)+			Ħ			`
Vindows Type					5.44		1/[1/(1)+		5.23	片			(2
Villaows Type Valls Type1			40.0		4.8	=		:	4.62	=			(2
• •	31.		10.24	_	21.46	=	0.15	_ -	3.22	믁 ¦		┥	(2)
Walls Type2	19		1.44		17.56	<u> </u>	0.15	- -	2.63	<u> </u>		_	(2
Valls Type3	11.	1	2.4		8.7	X	0.15	_ =	1.3	닠 !		⊣	(2
Valls Type4	2.4		0		2.4	X	0.35	=	0.84				(2
Total area of e					64.2								(3
for windows and it include the area						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric heat los				o ana pan	1110110		(26)(30)) + (32) =				22.59	(3
Heat capacity		•	O)				, , , ,		(30) + (3:	2) + (32a).	(32e) =	701.68	==
Thermal mass			P = Cm =	- TFΔ) ir	n k.l/m²K			., ,	tive Value	, , ,	(020) =	250	(3
For design assess	sments wh	ere the de	tails of the				recisely the				able 1f	230	(0
hermal bridg				ısina Ar	nendix k	<						9.63	(3
details of therma	•	,			•	`						9.03	(0
otal fabric he			o (00)	0,000,11	•/			(33) +	(36) =			32.22	(3
entilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 17.73	17.52	17.31	16.25	16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89	1	(3
 Heat transfer of	coefficier	nt. W/K			•	•	•	(39)m	= (37) + (38)m	•		
39)m= 49.95	49.74	49.52	48.47	48.26	47.2	47.2	46.99	47.62	48.26	48.68	49.1]	
10.00									1	ı			

Heat lo	oss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.75	0.74	0.74	0.72	0.72	0.7	0.7	0.7	0.71	0.72	0.73	0.73		
						Į.	Į.		,	Average =	Sum(40) ₁	12 /12=	0.72	(40)
Numbe	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 requi	rement:								kWh/ye	ear:	
if TF	ned occu FA > 13.9 FA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		17		(42)
Reduce	I averag the annua e that 125	l average	hot water	usage by	5% if the a	lwelling is	designed t	` ,		se target o		.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
											m(44) ₁₁₂ =		1029.18	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If in atom	tonoous w	ator booti	na ot noint	of use /ne	bot water	r ataraga)	antar O in	havea (46		Total = Su	m(45) ₁₁₂ =	_	1349.41	(45)
	taneous w													(40)
(46)m= Water	20.99 storage	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	je volum		includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel	_	0		(47)
	munity h	,										<u> </u>		,
	vise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
٠.	y lost fro		•					(48) x (49)) =		1	10		(50)
,	nanufacti ater stora			•								1		(54)
	munity h	-			e z (KVV	ii/iiiie/ua	iy <i>)</i>				0.	02		(51)
	e factor	_									1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							-	.6		(53)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or (54) in (5	55)	·							1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
												m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(37)111–	' '													
		loss (an	nual) fra	m Table		•			-			0		(58)
Primar	y circuit	`	,			59)m = ((58) ÷ 36	55 × (41)	m			0		(58)
Primar Primar		loss cal	culated t	for each	month (•	. ,	, ,		r thermo		0		(58)

Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (41)m						
(61)m= 0 0 0	0 0	0 0	0	0	0	0	0		(61)
Total heat required for water h	eating calculated	for each month	(62)m = 0	D.85 × (4	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.18 172.29 181.54	163.58 160.9	144.64 139.74	152.2	151.57	169.58	178.26	190.77		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quantit	y) (enter '0' i	f no solar	contributi	on to wate	r heating)	•	
(add additional lines if FGHRS	and/or WWHRS	applies, see Ap	pendix G))					
(63)m= 0 0 0	0 0	0 0	0	0	0	0	0		(63)
FHRS 18.03 16.04 16.49	14.58 14.03	12.18 11.28	12.94	13.08	15.09	16.32	17.54		(63) (G2)
Output from water heater									
(64)m= 174.47 153.83 162.37	146.4 144.19	129.86 125.78	136.58	135.89	151.81	159.35	170.55		_
			Outpu	ıt from wa	ter heate	(annual) _{1.}	12	1791.08	(64)
Heat gains from water heating	kWh/month 0.2	5 ´ [0.85 × (45)n	n + (61)m]	+ 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.74 80.63 86.21	79.4 79.34	73.1 72.31	76.45	75.41	82.23	84.28	89.27		(65)
include (57)m in calculation	of (65)m only if c	ylinder is in the	dwelling o	r hot wa	ater is fr	om com	munity h	eating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	its								
Jan Feb Mar	Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56 108.56	108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in A	opendix L, equat	ion L9 or L9a), a	also see Ta	able 5					
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6.66	8.66	11.62	14.75	17.22	18.36		(67)
Appliances gains (calculated in	n Appendix L, eq	uation L13 or L1	3a), also s	see Tab	ole 5				
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in A	ppendix L, equat	tion L15 or L15a), also see	e Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table	5a)							•	
(70)m= 0 0 0	0 0	0 0	0	0	0	0	0		(70)
Losses e.g. evaporation (nega	tive values) (Tab	ole 5)		·				•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)			•	•				•	
(72)m= 121.96 119.98 115.87	110.27 106.64	101.53 97.18	102.75	104.73	110.52	117.06	119.99		(72)
Total internal gains =		(66)m + (67)r	n + (68)m + ((69)m + (7	70)m + (7	1)m + (72)	m		
(73)m= 385.59 383.58 371.53	352.22 332.75	313.94 301.7	307.29	317.21	336.72	359.09	375.72		(73)
6. Solar gains:									
Solar gains are calculated using sola	r flux from Table 6a	and associated equa	ations to con	vert to the	e applicab	le orientat	ion.		
Orientation: Access Factor	Area	Flux		g_ -	_	FF		Gains	
Table 6d	m²	Table 6a	Ia	ble 6b	_ la	able 6c		(W)	_
South 0.9x 0.77 x	5.44	x 46.75	x	0.4	x	0.7	=	49.35	(78)
South 0.9x 0.77 x	4.8	x 46.75	x	0.4	_ x _	0.7	=	43.54	(78)
South 0.9x 0.77 x	5.44	x 76.57	x	0.4	x	0.7	=	80.82	(78)
South 0.9x 0.77 x	4.8	x 76.57	х	0.4	_ x _	0.7	=	71.31	(78)

	_					_			,			_				
South	0.9x	0.77		X	5.44	X	9	7.53	X		0.4	X	0.7	=	102.95	(78)
South	0.9x	0.77		X	4.8	X	9	7.53	X		0.4	X	0.7	=	90.84	(78)
South	0.9x	0.77		X	5.44	X	1	10.23	X		0.4	X	0.7	=	116.36	(78)
South	0.9x	0.77		X	4.8	X	1	10.23	X		0.4	X	0.7	=	102.67	(78)
South	0.9x	0.77		X	5.44	X	1	14.87	X		0.4	X	0.7	=	121.26	(78)
South	0.9x	0.77		X	4.8	X	1	14.87	X		0.4	X	0.7	=	106.99	(78)
South	0.9x	0.77		X	5.44	x	1	10.55	X		0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77		X	4.8	X	1	10.55	X		0.4	X	0.7	=	102.96	(78)
South	0.9x	0.77		X	5.44	X	1	08.01	X		0.4	X	0.7	=	114.01	(78)
South	0.9x	0.77		X	4.8	x	1	08.01	X		0.4	X	0.7	=	100.6	(78)
South	0.9x	0.77		X	5.44	X	1	04.89	X		0.4	X	0.7	=	110.72	(78)
South	0.9x	0.77		X	4.8	X	1	04.89	X		0.4	X	0.7	=	97.7	(78)
South	0.9x	0.77		X	5.44	x	1	01.89	x		0.4	X	0.7	=	107.55	(78)
South	0.9x	0.77		X	4.8	X	1	01.89	X		0.4	X	0.7	=	94.9	(78)
South	0.9x	0.77		X	5.44	x	8	2.59	x		0.4	X	0.7	=	87.18	(78)
South	0.9x	0.77		X	4.8	x	8	2.59	x		0.4	X	0.7	=	76.92	(78)
South	0.9x	0.77		X	5.44	×	5	5.42	x		0.4	X	0.7	=	58.5	(78)
South	0.9x	0.77		X	4.8	X	5	5.42	Х		0.4	X	0.7	=	51.62	(78)
South	0.9x	0.77		X	5.44	x		40.4	x		0.4	X	0.7		42.64	(78)
South	0.9x	0.77		х	4.8	х		40.4] x		0.4	X	0.7	=	37.63	(78)
West	0.9x	0.77		X	1.44	X	1	9.64	x		0.4	X	0.7	=	5.49	(80)
West	0.9x	0.77		х	1.44	x	3	8.42	Х		0.4	X	0.7	=	10.74	(80)
West	0.9x	0.77		х	1.44	X	6	3.27	x		0.4	X	0.7	=	17.68	(80)
West	0.9x	0.77		х	1.44	×	9	2.28	x		0.4	X	0.7	=	25.78	(80)
West	0.9x	0.77		X	1.44	×	1	13.09	x		0.4	X	0.7	=	31.6	(80)
West	0.9x	0.77		X	1.44	x	1	15.77	X		0.4	X	0.7	=	32.35	(80)
West	0.9x	0.77		X	1.44	x	1	10.22	X		0.4	X	0.7	=	30.8	(80)
West	0.9x	0.77		X	1.44	x	9	4.68	X		0.4	X	0.7	=	26.45	(80)
West	0.9x	0.77		X	1.44	×	7	3.59	X		0.4	X	0.7	=	20.56	(80)
West	0.9x	0.77		X	1.44	×	4	5.59	x		0.4	X	0.7	=	12.74	(80)
West	0.9x	0.77		X	1.44	x	2	4.49	X		0.4	X	0.7	=	6.84	(80)
West	0.9x	0.77		X	1.44	x	1	6.15	X		0.4	X	0.7	=	4.51	(80)
Solar	ains in	watts, ca	lculate	ed	for each mo	nth_		•	÷÷		um(74)m .	<u> </u>			-	
(83)m=	98.38	162.87	211.48		244.82 259.		252	245.41	234	.88	223.01	176.8	33 116.95	84.78		(83)
_				_	(84)m = (73)		• ,								7	
(84)m=	483.97	546.46	583.01		597.03 592	6	565.95	547.11	542	.17	540.21	513.	476.04	460.5		(84)
7. Me	an inter	nal temp	eratur	e (heating seas	on)										
Temp	erature	during he	eating	ре	eriods in the	living	area '	from Tab	ole 9	, Th′	1 (°C)				21	(85)
Utilisa	ation fac			$\overline{}$	ving area, h1	,m (see Ta	ble 9a)							- -	
	Jan	Feb	Mar	_	Apr Ma	Ť	Jun	Jul	_	ug	Sep	Oc		Dec	_	
(86)m=	0.99	0.98	0.95		0.87 0.73	3	0.53	0.38	0.	4	0.6	0.87	0.98	0.99		(86)

Ref 20.46 20.6 20.75 20.9 20.98 21 21 21 21 21 20.92 20.68 20.44	Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
Column 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3]	(87)
Column 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3 20.3	Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	,	
Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column C	(88)m= 20.3 20.31 20.32 20.32 20.34 20.34 20.34 20.33 20.32 20.32 20.31]	(88)
Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column Column C	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	•	
19.59 19.78 20 20.21 20.3 20.34 20.34 20.34 20.33 20.24 19.91 19.57 (90)]	(89)
19.59 19.78 20 20.21 20.3 20.34 20.34 20.34 20.33 20.24 19.91 19.57 (90)	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	•	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)ms 19:95 20:12 20:31 20:49 20:58 20:61 20:61 20:61 20:6 20:51 20:22 19:93 (92)		1	(90)
19.95 20.12 20.31 20.49 20.58 20.61 20.61 20.61 20.6 20.51 20.22 19.93 (92)	fLA = Living area ÷ (4) =	0.41	(91)
19.95 20.12 20.31 20.49 20.58 20.61 20.61 20.61 20.6 20.51 20.22 19.93 (92)	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_
Same 19.95 20.12 20.31 20.49 20.58 20.61 20.61 20.61 20.61 20.6 20.51 20.22 19.93 (93)]	(92)
Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second Second S	Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(93)m= 19.95 20.12 20.31 20.49 20.58 20.61 20.61 20.61 20.6 20.51 20.22 19.93		(93)
The utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Space heating requirement		
Utilisation factor for gains, hm: (94)m= 0.99		culate	
(94) (94) (94) (95) (94) (95) (94) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (9	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Useful gains, hmGm, W = (94)m x (84)m (95)m= 478.03 531.01 546.14 508.99 416.97 282.7 189.08 197.69 307.5 435.41 460.86 456.21 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W = ((39)m x [(33)m - (96)m] (97)m= 781.5 756.76 683.76 561.84 428.36 283.46 189.12 197.75 309.53 478.39 638.89 772.12 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 225.78 151.71 102.38 38.05 8.48 0 0 0 0 31.98 128.16 235.04 (98) Space heating requirement in kWh/m²/year 13.75 (99) 9b. Energy requirements - Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301) Fraction of space heat from community system 1 - (301) =		,	
(95)			(94)
Monthly average external temperature from Table 8 (96)ml= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = ((93)m × ((93)m - (96)m) (97)ml		1	(05)
(96)]	(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 781.5 756.76 683.76 561.84 428.36 283.46 189.12 197.75 309.53 478.39 638.89 772.12 (97)		1	(06)
(97)m= 781.5 756.76 683.76 561.84 428.36 283.46 189.12 197.75 309.53 478.39 638.89 772.12 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 225.78 151.71 102.38 38.05 8.48 0 0 0 0 31.98 128.16 235.04 Total per year (kWh/year) = Sum(98)6312 = 921.58 (98) Space heating requirement in kWh/m²/year 13.75 (99) 9b. Energy requirements - Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump (302) x (303a) = 1 (303a) Fraction of total space heat from Community heat pump (302) x (303a) = 1 (305) Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating		J	(90)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 225.78 151.71 102.38 38.05 8.48 0 0 0 0 31.98 128.16 235.04 Total per year (kWh/year) = Sum(98). ss. 12 921.58 (98) Space heating requirement in kWh/m²/year 13.75 (99) 9b. Energy requirements - Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a) Fraction for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating kWh/year		1	(97)
(98)m= 225.78 151.71 102.38 38.05 8.48 0 0 0 0 31.98 128.16 235.04 Total per year (kWh/year) = Sum(98)ss_1.12 = 921.58 (98) Space heating requirement in kWh/m²/year 13.75 (99) 9b. Energy requirements — Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump (302) x (303a) = 1 (304a) Fractor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating]	(0.)
Space heating requirement in kWh/m²/year 13.75 99. 9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 1 (301) Fraction of space heat from community system 1 – (301) = 1 (302) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump 1 (303a) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system kWh/year]	
Space heating requirement in kWh/m²/year 9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from community system 1 – (301) = The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 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 heating system 1 (305) Distribution loss factor (Table 12c) for community heating system kWh/year		921.58	(98)
Space heating Space heating Space heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a) Fractor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating kWh/year	Space heating requirement in kWh/m²/year	13.75] [99)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none [O] (301) Fraction of space heat from community system 1 – (301) = [The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump [O] (301) [O] (301) [O] (302) [O] (303) [O] (303) [O] (303) [O] (304) [O] (304) [O] (305) [O] (306) [O] (306) [O] (307) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O] (308) [O		16.76	
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump 1 (303a) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$			
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump [303a] Fraction of total space heat from Community heat pump [302] × (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system [305] Distribution loss factor (Table 12c) for community heating system [306] Space heating		0	(301)
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump 1 (303a) Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system 1 (305) Space heating kWh/year	Fraction of space heat from community system $1 - (301) =$	1	(302)
Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system 1 (304a) 1 (305) 1 (305) Space heating kWh/year		he latter	
Factor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating kWh/year	Fraction of heat from Community heat pump	1	(303a)
Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating kWh/year	Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Space heating kWh/year	Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
	Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Annual space heating requirement 921.58	Space heating	kWh/year	_
	Annual space heating requirement	921.58	

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	967.66	(307a)
Efficiency of secondary/supplementary heating system in % (from		0](308
Space heating requirement from secondary/supplementary systematics	,	0] (309)
			」` ′
Water heating Annual water heating requirement		1791.08	7
If DHW from community scheme:	(0.4) (0.00) (0.05) (0.00)		
Water heat from Community heat pump	$(64) \times (303a) \times (305) \times (306) =$	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)]](313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	$=(107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside	119.54	(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) =	119.54	(331)
Energy for lighting (calculated in Appendix L)		315.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	· (245) · (224) · (222) (227b)	2765.11	(220)
Total delivered energy for all uses $(307) + (309) + (310) + (312)$	+ (315) + (331) + (332)(2370) =	2703.11	(338)
12b. CO2 Emissions – Community heating scheme		2765.11	(336)
	Energy Emission factor kWh/year kg CO2/kWh		
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP)	Energy Emission factor	or Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	Energy Emission factor kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(Energy Emission factor kg CO2/kWh two fuels repeat (363) to (366) for the second f	r Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	er Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	r Emissions kg CO2/year	(367a) (367) (372)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	r Emissions kg CO2/year uel 256 = 577.45 = 14.78 = 592.23	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	er Emissions kg CO2/year Tuel 256 = 577.45 = 14.78 = 592.23 = 0	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	r Emissions kg CO2/year ruel 256 = 577.45 = 14.78 = 592.23 = 0 = 0	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	er Emissions kg CO2/year ruel	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	er Emissions kg CO2/year Tuel	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applications.	Energy kWh/year Emission factor kg CO2/kWh give fuels repeat (363) to (366) for the second for (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (309) x 0 ous heater (312) x 0.22 (373) + (374) + (375) = ng (331)) x 0.52 (332))) x 0.52	r Emissions kg CO2/year ruel 256 = 577.45 = 14.78 = 592.23 = 0 = 0 592.23 = 62.04 = 163.72	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application.	Energy kWh/year Emission factor kg CO2/kWh give fuels repeat (363) to (366) for the second for (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (309) x 0 ous heater (312) x 0.22 (373) + (374) + (375) = ng (331)) x 0.52 (332))) x 0.52	r Emissions kg CO2/year ruel	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwellin CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application Total CO2, kg/year sum of (376)(382) =	Energy kWh/year Emission factor kg CO2/kWh give fuels repeat (363) to (366) for the second for (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (309) x 0 ous heater (312) x 0.22 (373) + (374) + (375) = ng (331)) x 0.52 (332))) x 0.52	Emissions kg CO2/year Tuel	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380) (383)

			User D	otaile: -						
Access Name					_ \]	. La a				
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa				Vorcio	on: 1.0.5.51	
Software Name:	Stroma FSAF 201.					e 4 (Mid)		versio	JII. 1.0.5.51	
Address :		11	operty /	nuuress.	Jampi	e - (iviia)	/			
Overall dwelling dimer	nsions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor				67	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)		67	(4)	<u> </u>		_		
Dwelling volume	, , , , , , , , , , , , , , , , , , , ,	, ,)+(3c)+(3c	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:									201	(-/
z. vermanon rate.		condary	/	other		total			m³ per hou	ır
Number of chimneys	heating h	eating 0] + [0] = Г	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	」	0]	0	x :	20 =	0	(6b)
Number of intermittent fan] [0	J <u>L</u>			10 =		= `
	15				Ļ	2			20	(7a)
Number of passive vents						0		10 =	0	(7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimney	s flues and fans - (6s	a)+(6b)+(7s	a)+(7h)+(70) -						
If a pressurisation test has be					continue fi	20 rom (9) to		÷ (5) =	0.1	(8)
Number of storeys in the		,,,					/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber f	rame or	0.35 for	masonr	y consti	ruction			0	(11)
if both types of wall are pre deducting areas of opening		oonding to	the greate	er wall are	a (after					
If suspended wooden flo		ed) or 0.1	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	•	,	`	,,					0	(13)
Percentage of windows	and doors draught str	ripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
Air permeability value, o	•		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabilit									0.35	(18)
Air permeability value applies Number of sides sheltered		been done	e or a deg	gree air pe	rmeability	is being u	sed			(10)
Shelter factor	1			(20) = 1 -	[0.075 x (19)] =			0.85	(19)
Infiltration rate incorporation	ng shelter factor			(21) = (18)) x (20) =				0.3	(21)
Infiltration rate modified for									0.0	` ′
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind spe						•	•	•	•	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
							•			
Wind Factor $(22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m = (22a)m $	' 					1	1	1 .	1	
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation 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	0.27	0.3	0.32	0.33	0.35		
Calculate effec		_	rate for t	he appli	cable ca	se							
If mechanica							.=					0	(23
If exhaust air he) = (23a)			0	(23
If balanced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	entilation	without	heat rec	overy (N	/IV) (24b	m = (22)	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n				•	•				0.5]	<u>!</u>			
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		(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) 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
2 Heat lease	and b	oʻ loog	0 0 11 0 120 0 1										
3. Heat losse ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
)oo <mark>rs</mark>	G.: 3 G.	()	, i		2.4	×	1	=	2.4		,,,,,,		(26
Vin <mark>dows</mark> Type	1				1.44		 /[1/(1.4)+		1.91	Ħ			(27
Vindows Type					5.44		/[1/(1.4)+		7.21	Б			(27
Vindows Type	: 3				4.8	x1	/[1/(1.4)+	0.04] =	6.36				(27
Valls Type1	31.	7	10.2	4	21.46	x	0.18	=	3.86				(29
Valls Type2	19		1.44		17.56	x	0.18	=	3.16	\neg			(29
Valls Type3	11.	1	2.4		8.7	X	0.18	=	1.57	₹ i		$\neg \sqcap$	(29
Valls Type4	2.4		0		2.4	x	0.18	=	0.43	₹ i		7 F	(29
otal area of e	lements	, m²			64.2								(31
for windows and * include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	3.2	
abric heat los	s, W/K	= S (A x	U)	,			(26)(30)	+ (32) =				26.9	(3:
leat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	701.6	
hermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		`
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						3.21	(36
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			30.12	2 (37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ([25)m x (5])		,
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 37.92	37.74	37.56	36.71	36.55	35.81	35.81	35.67	36.09	36.55	36.87	37.21		(38
leat transfer of	nefficie	nt \N/K						(39)m	= (37) + (38)m		ı	
			00.00	00.00	65.92	05.00	65.79	66.21	66.66	66.99	67.32	1	
39)m= 68.04	67.85	67.67	66.82	66.66	05.97	65.92	1 00.79	00.21	ממ.מס	פא.מס ו	1 07.37		

eat lo	ss para	meter (F	ILP), W/	m²K			•		(40)m	= (39)m ÷	(4)			
0)m=	1.02	1.01	1.01	1	0.99	0.98	0.98	0.98	0.99	0.99	1	1		
umba	r of dov	a in mar	sth /Tabl	o 1o)					,	Average =	Sum(40) ₁	.12 /12=	1	(4
umbe T	Jan	Feb	nth (Tabl Mar		May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec		
1)m=	31	28	31	Apr 30	31	30	31	Aug 31	30 30	31	30	31		(4
' <i>,</i> ''.'- L			01		01			<u> </u>				01		(.
I. Wat	ter heat	ing ener	gy requi	rement:								kWh/yea	r:	
	od ooou	nonov N	.1											
if TF			ч + 1.76 х	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.	.9)	17		(4
duce t	the annua	l average	iter usag hot water i person per	usage by t	5% if the d	lwelling is	designed t			se target o	85	.76		(4
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t wate			day for ea		,			_	ССР		1107			
l)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
											m(44) ₁₁₂ =		1029.18	(4
ergy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
)m= [139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
nstanta	aneous w	ater heatir	ng at point	of use (no	hot water	storage)	enter 0 in	hoxes (46		Total = Su	m(45) ₁₁₂ =		1349.41	(-
_	20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(4
	storage		10.34	10.51	13.04	13.07	12.07	14.54	14.71	17.13	10.72	20.32		(
orage	e volum	e (litres)	includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(
comn	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	r (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage		olorod k	ooo footo	r io kno		2/dox4):							,
			eclared lo		or is kno	wn (Kvvr	i/day):				1.3			(•
			m Table					(40) (40)			0.			(•
•			storage, clared c	-		or is not		(48) x (49)) =		0.	75		(
			factor from	•)		(
	-	•	ee sectio	on 4.3										
		from Tal									()		(
mpe	rature fa	actor fro	m Table	2b)		(
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	()		(
,	. , ,	54) in (5	•								0.	75		(
ater s	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
ylinde	r contains	dedicated	d solar stor	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendix	Н	
)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
mary	circuit	loss (an	nual) fro	m Table	3							0		(
-		•	culated f			59)m = ((58) ÷ 36	65 × (41)	m					
	lified by	factor fr	om Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(mod	illed by	140101 11	<u> </u>						<u> </u>					

Combi	loss ca	lculated	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 h	eat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09]	(62)
Solar DH	łW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	1	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	see Ap	pendix	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
·			-	-		-		Ot	itput from wa	ater heate	r (annual)₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	د [(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	de (57)	m in calc	culation of	of (65)m	only if c	ylinder is	s in the o	dwellin	g or hot w	ater is fr	om com	munity h	- neating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	ıs (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Lightin	g gains	(calculat	ted in Ap	pendix l	L, equat	ion L9 o	^r L9a), a	lso see	Table 5					
(67)m=	17.41	15.46	12.58	9.52	7.12	6.01	6.49	8.44	11.33	14.38	16.79	17.89		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1:	3a), als	so see Ta	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookin	g gains	(calcula	ited in A	ppendix	L, equat	tion L15	or L15a)	, also	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	and fa	ns gains	(Table 5	<u> </u>		•		•	•	•	•	•	•	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)		•					•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)					•	•			•	•	
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65]	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	1)m + (72)	m	•	
(73)m=	378.8	376.85	364.87	345.64	326.23	307.45	295.2	300.74	310.58	330.01	352.32	368.92		(73)
6. Sol	ar gains	s:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a	and associ	ated equa	tions to	convert to th	e applicat	ole orientat	ion.		
Orienta		Access F		Area		Flu			_ g	_	FF		Gains	
	_	Table 6d		m²		l at	ole 6a		Table 6b		able 6c		(W)	_
South	0.9x	0.77	X	5.4	4	x 4	6.75	x	0.63	x	0.7		77.73	(78)
South	0.9x	0.77	X	4.8	3	x 4	6.75	x	0.63	x	0.7	=	68.58	(78)
South	0.9x	0.77	Х	5.4	4	x 7	6.57	x	0.63	x	0.7	=	127.3	(78)
South	0.9x	0.77	х	4.8	3	x 7	6.57	х	0.63	х	0.7	=	112.32	(78)

	_			_		,			,			_				_
South	0.9x	0.77)	: <u> </u>	5.44	X	9	7.53	X		0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77	>		4.8	X	9	7.53	X		0.63	X	0.7	=	143.08	(78)
South	0.9x	0.77	>		5.44	X	1	10.23	X		0.63	X	0.7	=	183.27	(78)
South	0.9x	0.77)		4.8	×	1	10.23	X		0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77)		5.44	X	1	14.87	X		0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77)		4.8	X	1	14.87	X		0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77)		5.44	X	1	10.55	X		0.63	X	0.7	=	183.79	(78)
South	0.9x	0.77)		4.8	×	1	10.55	x		0.63	X	0.7	=	162.17	(78)
South	0.9x	0.77)		5.44	X	10	08.01	X		0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77)		4.8	X	10	08.01	X		0.63	X	0.7	=	158.45	(78)
South	0.9x	0.77)		5.44	×	10	04.89	x		0.63	X	0.7	=	174.39	(78)
South	0.9x	0.77)		4.8	×	10	04.89	x		0.63	X	0.7	=	153.87	(78)
South	0.9x	0.77)		5.44	x	10	01.89	x		0.63	X	0.7	=	169.39	(78)
South	0.9x	0.77)		4.8	×	10	01.89	x		0.63	X	0.7	=	149.46	(78)
South	0.9x	0.77)		5.44	X	8	2.59	x		0.63	x	0.7	=	137.3	(78)
South	0.9x	0.77)		4.8	X	8	2.59	X		0.63	x	0.7	=	121.15	(78)
South	0.9x	0.77	>		5.44	×	5	5.42	x		0.63	X	0.7	=	92.13	(78)
South	0.9x	0.77)		4.8	X	5	5.42	Х		0.63	X	0.7	=	81.29	(78)
South	0.9x	0.77)		5.44	х		40.4	x		0.63	X	0.7	=	67.16	(78)
South	0.9x	0.77)		4.8	х		40.4	_ x		0.63	X	0.7	=	59.26	(78)
West	0.9x	0.77)		1.44	X	1	9.64	x		0.63	X	0.7	=	8.64	(80)
West	0.9x	0.77	—		1.44	X	3	8.42	Х		0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77	/		1.44	x	6	3.27	X		0.63	x	0.7	=	27.85	(80)
West	0.9x	0.77)		1.44	×	9	2.28	x		0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77)		1.44	X	1	13.09	x		0.63	X	0.7	=	49.77	(80)
West	0.9x	0.77)		1.44	X	1	15.77	x		0.63	x	0.7	=	50.95	(80)
West	0.9x	0.77)		1.44	X	1	10.22	x		0.63	X	0.7	=	48.51	(80)
West	0.9x	0.77)		1.44	×	9	4.68	x		0.63	x	0.7	=	41.67	(80)
West	0.9x	0.77)		1.44	×	7	3.59	x		0.63	X	0.7	=	32.39	(80)
West	0.9x	0.77)		1.44	X	4	5.59	X		0.63	X	0.7	=	20.06	(80)
West	0.9x	0.77)		1.44	×	2	4.49	x		0.63	x	0.7	=	10.78	(80)
West	0.9x	0.77)		1.44	×	1	6.15	x		0.63	X	0.7	=	7.11	(80)
-	$\overline{}$			_	or each mon	_			`	_	ım(74)m .	<u> </u>			1	
(83)m=	154.95	256.53	333.08		385.59 409.2		396.91	386.53	369	.93	351.23	278.5	1 184.2	133.53		(83)
_				Ť	84)m = (73)r	_	` '		T	1			. 1		1	(0.4)
(84)m=	533.75	633.37	697.95	L	731.22 735.4	9 7	704.36	681.72	670	.67	661.81	608.5	2 536.52	502.45]	(84)
7. Me	an inter	nal temp	erature	((h	neating seaso	on)										
Temp	erature	during he	eating	ре	riods in the li	ving	area 1	from Tab	ole 9	, Th1	1 (°C)				21	(85)
Utilisa				liv	ving area, h1	Ť					ı			1	1	
	Jan	Feb	Mar	\downarrow	Apr Ma	` 	Jun	Jul	_	ug	Sep	Oc	+	Dec	ļ	
(86)m=	0.99	0.98	0.95		0.89 0.77		0.59	0.42	0.4	15	0.66	0.9	0.98	0.99]	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.13 20.32 20.54 20.77 20.92 20.99 21 21 20.97 20.79 20.42 20.09 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.07 20.07 20.07 20.09 20.09 20.09 20.1 20.1 20.1 20.09 20.09 20.09 20.08 20.08 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.94 0.86 0.71 0.51 0.34 0.36 0.59 0.87 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.07 20.07 20.07 20.09 20.09 20.1 20.1 20.1 20.09 20.09 20.09 20.08 20.08 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.94 0.86 0.71 0.51 0.34 0.36 0.59 0.87 0.97 0.99 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) fLA = Living area ÷ (4) = 0.41 (91)
(88)m= 20.07 20.07 20.07 20.09 20.09 20.1 20.1 20.1 20.09 20.09 20.08 20.08 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.94 0.86 0.71 0.51 0.34 0.36 0.59 0.87 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) fLA = Living area ÷ (4) = 0.41 (91)
(89)m= 0.99 0.97 0.94 0.86 0.71 0.51 0.34 0.36 0.59 0.87 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) fLA = Living area ÷ (4) = 0.41 (91)
(89)m= 0.99 0.97 0.94 0.86 0.71 0.51 0.34 0.36 0.59 0.87 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) fLA = Living area ÷ (4) = 0.41 (91)
(90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) fLA = Living area ÷ (4) = 0.41 (91)
(90)m= 18.92 19.2 19.52 19.83 20.02 20.09 20.1 20.1 20.07 19.86 19.35 18.88 (90) fLA = Living area ÷ (4) = 0.41 (91)
$fLA = Living area \div (4) = 0.41$ (91)
(92)m= 19.41 19.66 19.94 20.22 20.38 20.45 20.46 20.46 20.44 20.24 19.78 19.37 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate
(93)m= 19.41 19.66 19.94 20.22 20.38 20.45 20.46 20.46 20.44 20.24 19.78 19.37 (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= 0.99 0.97 0.94 0.86 0.73 0.54 0.37 0.4 0.62 0.87 0.97 0.99 (94)
Useful gains, hmGm , W = (94)m x (84)m
(95)m= 526.96 614.3 653.04 631.25 538.97 380.19 254.12 266.52 407.67 530.57 520.93 497.63 (95)
Monthly average external temperature from Table 8
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]
(97)m= 1028.38 1001.43 909.31 756.12 578.96 385.93 254.7 267.36 419.79 642.71 849.7 1021.36 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
(98)m= 373.06 260.15 190.66 89.9 29.75 0 0 0 83.43 236.71 389.66
Total per year (kWh/year) = Sum(98) _{15,912} = 1653.33 (98)
Space heating requirement in kWh/m²/year 24.68 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (201)
Fraction of space heat from main system(s) $(202) = 1 - (201) = 1$ (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1 93.5 (206)
Efficiency of secondary/supplementary heating system, % 0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)
373.06 260.15 190.66 89.9 29.75 0 0 0 83.43 236.71 389.66
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211)
398.99 278.24 203.92 96.15 31.82 0 0 0 0 89.23 253.17 416.74
Total (kWh/year) =Sum(211) _{15,1012} = 1768.27 (211)

Space heating fuel (secondary), kWh/month								
$= \{[(98)m \times (201)]\} \times 100 \div (208)$								
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		_
		Total	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating								
Output from water heater (calculated above) 186.5 164.45 172.86 155.17 152.22 13	36.24 131.06	143.52	143.17	160.9	169.86	182.09		
Efficiency of water heater	00.24	140.02	140.17	100.0	100.00	102.00	79.8	(216)
<u> </u>	79.8 79.8	79.8	79.8	83.16	85.7	86.79		(217)
Fuel for water heating, kWh/month		!!						
(219) m = (64) m x $100 \div (217)$ m								
(219)m= 215.29 191.15 203.19 186.02 187.07 1	70.73 164.23	179.84	179.41	193.48	198.21	209.79		٦
Annual totals		rotai	I = Sum(2 ⁻		A/I. /		2278.4	(219)
Annual totals Space heating fuel used, main system 1				K	Wh/year	' 	kWh/year 1768.27	7
Water heating fuel used							2278.4	<u> </u>
•							2210.4	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							307.48	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)	(237b)	=				4429.15	(338)
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP						
							_	
	kWh/year			kg CO	ion fac 2/kWh	tor	Emissio ns kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	381.95	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	492.13	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				874.08	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	159.58	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1072.59	(272)
								_

TER =

(273)

16.01

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height:

Floor 0 67 m^2 3 m

27.5 m² (fraction 0.41) Living area:

Unspecified Front of dwelling faces:

Opening types:

Nan	ne:	Source:		Type:	Glazing:		Argon:	Frame:
DOO	R	<u>Manuf</u> actı	ırer	Solid				Wood
Ε		Manufactu	ırer	Windows	low-E, $En = 0.0$	5, soft coat	No	
Balco	ny	Manufactu	ırer	Windows	low-E, $En = 0.0$	5, soft coat	No	

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
E		E	East	0	0
Balcony		E	East	0	0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
E	29.4	8.96	20.44	0.15	0	False	N/A
INT	12	2.4	9.6	0.16	0.43	False	N/A
Spandrel	2.44	0	2.44	0.35	0	False	N/A
Internal Floment	c						

<u>Internal Elements</u> Party Elements

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Yes (As designed) Pressure test:

SAP Input

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary neating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901 Fuel :mains gas

No hot water cylinder
Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester

Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Dwelling volume 2. Ventilation rate: main secondary other total m³ per hour				User E	Details:						
Address: 1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³)		Stroma FSAP 20	12						Versio	on: 1.0.5.51	
Area(m²)			Р	roperty	Address	: Sampl	e 5 (Mid)			
Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout Strout S											
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)	Overall dwelling dimer	nsions:		A	- (2\		A., 11a	! a.l. 4/.a.\		Value of m	2)
Develling volume Cash+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)	Ground floor			Are		(1a) x	Av. ne		(2a) =		(3a)
Number of chimneys	Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	۱)	67	(4)					
Number of chimneys	Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
Number of chimneys	2. Ventilation rate:										
Number of open flues 0	Number of chimneys	heating	heating	· 		7 <u>-</u> F			40 =	-	_
Number of intermittent fans Number of passive vents \[0 \text{x10} = 0 \] Number of flueless gas fires \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = 0 \] \[\text{val} = \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \text{val} \qu	•			╛╘		_					(6a
Number of passive vents 0	·		0	」 [†]	0	」 [■]	0			0	(6b
Number of flueless gas fires 0	Number of intermittent fan	S				L	0	X	10 =	0	(7a
Air changes per hour Infiltration due to chimneys, flues and fans = (60)+(6b)+(7a)+(7b)+(7c) =	Number of passive vents						0	X	10 =	0	(7b)
Infiltration due to chimneys, flues and fans = (6e)+(6b)+(7e)+(7e)+(7e)+(7e)+(7e)+(7e)+(7e)+(7e	Number of flueless gas fire	es					0	X	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: 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 Percentage of windows and doors draught stripped Window infiltration Output Vindow infiltration Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Output Outp									Air ch	nanges per h	our
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: 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 Percentage of windows and doors draught stripped 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 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 Shelter factor (20) = 1 - [0.075 x (19)] = 0.78 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 (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	Infiltration due to chimney	s, flues and fans = (6a)+(6b)+(7	7a)+(7b)+((7c) =	Г	0		÷ (5) =	0	(8)
Additional 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 0.25 - [0.2 × (14) ÷ 100] = 0 (a)	If a pressurisation test has be	en carried out or is intend	ded, procee	d to (17),	otherwise o	continue f	rom (9) to				`
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 Infiltration rate 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 Shelter factor (20) = 1 - [0.075 × (19)] = O.78 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 (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		e dw <mark>elling</mark> (ns)								0	(9)
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 Office the first of the suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 Percentage of windows and doors draught stripped Window infiltration Office the first of the suspended wooden floor, enter 0.0 (and the suspended wooden floor), else enter 0 Percentage of windows and doors draught stripped Window infiltration Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the suspended wooden floor, enter 0.2 (and the suspended wooden floor), else enter 0 Office the first of the first of the first of the suspended wooden floor and suspended wooden floor. Infiltration rate incorporating shelter factor Office the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first of the first		OF for otaal or timber	t frame or	0.05 to				[(9)	-1]x0.1 =		(10
Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Section Sect						•	ruction			0	(11
If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration Infiltration rate 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 Shelter factor (20) = 1 - [0.075 × (19)] = Infiltration rate incorporating shelter factor (21) = (18) × (20) = 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 (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			operiumg te	ano grou	.cran are	a (a.co.					
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Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate incorporating shelter factor $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate modified for monthly wind speed $0.25 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m= $0.15 - [0.2 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] = 0.00$ (Infiltration rate modified from Table 7 (22)m = $0.12 - [0.25 \times (14) \div 100] $	•									0	(13
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Shelter factor (20) = 1 - [0.075 x (19)] = 0.78 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = 0.12 (21) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (20) = (18) x (2	•	-					is being u	ised		0.10	(
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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	•				(21) = (18) x (20) =				0.12	(21
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			i		1				1	7	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind spe	ed from Table 7					,			-	
	$(22)m = \begin{bmatrix} 5.1 & 5 & 4 \end{bmatrix}$	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	Wind Factor (22a)m = (22)m ÷ 4									
		·	0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
alculate effe		•	rate for t	he appli	cable ca	se	•	•	•	•	•	<u>'</u>	<u> </u>
If mechanical If exhaust air he			andiv NI (C	12h) (22	a) Fm. /	aguatian (I	NEN otho	muiaa (22h	\ (220\			0.5	(2
		0 11		, ,	,	. `	,, .	,) = (23a)			0.5	(2
If balanced with		•	-	_					21.) (001.) [4 (00 -)	79.05	(2
a) If balance				.		- ` ` 	, 	í `	 		```	÷ 100] I	(2
1a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	İ	(2
b) If balance					1		- ^ ` ` 	i `	 		Ι ,	1	10
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	j	(2
c) If whole h							on from (c) = (221		5 v (22h	,)			
1c)m= 0	0.5 7	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0	0	0	1	(2
,												İ	(2
d) If natural if (22b)n				•					0.5]				
1d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24k	b) or (24	c) or (24	d) in bo	к (25)	ļ.	ļ.	!	1	
5)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
								I					
. Heat losse									4 2/11				
LEMENT	Gros area		Openin		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
oors					2.4	x	1.4	= [3.36	7			(2
in <mark>dows</mark> Type	1				4.16	=	1/[1/(1)+	\	4	Ħ			(2
indows Type					4.8		1/[1/(1)+		4.62	Ħ			(2
alls Type1			0.00							╡ ,			`
• •	29.		8.96		20.44	=	0.15	=	3.07	ᆗ ¦			(2
alls Type2	12	_	2.4	_	9.6	X	0.15	=	1.44	亅 !		╡	(2
alls Type3	2.4		0		2.44	X	0.35	=	0.85	[_	(2
otal area of e					43.84								(3
or windows and include the area						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
abric heat los				is and par	uuons		(26)(30)) + (32) =				17.33	(3
eat capacity		,	O ,					((28)	(30) + (32	2) + (32a).	(32e) =	454.72	===
ermal mass		. ,	P = Cm -	- TFΔ) ir	n k.l/m²K				tive Value		(020) =	250	· · · · · · · · · · · · · · · · · · ·
r design assess	•	,		,			recisely the				able 1f	230	(
n be used inste				0077011.000			colocity and	, maroau v	74.400 0.				
nermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						6.58	(3
letails of therma		are not kn	own (36) =	= 0.05 x (3	31)								
tal fabric he	at loss							(33) +	(36) =			23.91	(3
entilation hea		i	monthly	y				(38)m	= 0.33 × (25)m x (5)) I	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 16.78	16.59	16.39	15.43	15.24	14.27	14.27	14.08	14.66	15.24	15.62	16.01		(3
								(30)m	= (37) + (3	30/m			
eat transfer o	oefficiei	nt, VV/K						(39)111	= (37) + (30)111			

Heat Id	ss para	meter (F	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.61	0.6	0.6	0.59	0.58	0.57	0.57	0.57	0.58	0.58	0.59	0.6		
Numba	r of dov	a in ma	oth /Tob	lo 1o\					1	Average =	Sum(40) ₁ .	12 /12=	0.59	(40)
numbe 	i	Feb	nth (Tab Mar		Mov	lup	Jul	Λιια	Sep	Oct	Nov	Dec		
(41)m=	Jan 31	28	31	Apr 30	May 31	Jun 30	31	Aug 31	30	31	Nov 30	31		(41)
(41)111=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
1 \\/o	tor boot	ing once	av roqui	romonti								kWh/ye	0.51	
4. VVa	ter neat	ing ener	gy requi	rement.								Kvvii/ye	ai.	
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		17		(42)
Reduce	the annua	l average	hot water	usage by		welling is	designed t	(25 x N) to achieve		se target o		5.76		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres per	day for ea		Vd,m = fa	ctor from	Table 1c x		•					
(44)m=	94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
Cnore .	antant of	hat water	used sel	aulated me	anthly 1	100 × Vd *		Tm / 2600			m(44) ₁₁₂ =		1029.18	(44)
								Tm / 3600		-				
(45)m=	139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77 m(45) ₁₁₂ =	135.49	1349.41	(45)
lf inst <mark>ant</mark>	<mark>ane</mark> ous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		i otai = Su	III(43) ₁₁₂ =		1349.41	(40)
(46)m=	20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
	storage		7											
								within sa	ame ves	sel		0		(47)
	-	_			•		litres in	(47) mbi boil	ars) ante	ar 'O' in <i>(</i>	(17)			
	storage		not wate	, (uno ii	ioidaco ii	iiotaiitai	10000 00	THE BOIL	oro, oric) III (71)			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
•			_	, kWh/ye				(48) x (49)) =		1	10		(50)
•				-	oss facto e 2 (kWl							20		(51)
		_	ee secti		C Z (KVVI	i/iiti G/GC	iy <i>)</i>				0.	.02		(31)
	•	from Tal									1.	03		(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter	(50) or (54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	r contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendi	κH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
					,	•	` '	65 × (41)						
` 1								ng and a			<u> </u>			
(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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	n month	(62)n	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.18	172.29	181.54	163.58	160.9	144.64	139.74	152.	2 151.57	169.58	178.26	190.77		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribu	tion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	18.03	16.04	16.49	14.58	14.03	12.18	11.28	12.9	4 13.08	15.09	16.32	17.54		(63) (G2)
Output	t from wa	ater hea	ter										_	
(64)m=	174.47	153.83	162.37	146.4	144.19	129.86	125.78	136.	58 135.89	151.81	159.35	170.55		_
								(Output from w	ater heate	er (annual)	112	1791.08	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	90.74	80.63	86.21	79.4	79.34	73.1	72.31	76.4	5 75.41	82.23	84.28	89.27		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelli	ng or hot w	vater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.5	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	n <mark>g g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	^r L9a), a	lso se	e Table 5					
(67)m=	18.93	16.81	13.67	10.35	7.74	6.53	7.06	9.17	12.31	15.63	18.25	19.45		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.3	32 145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)), alsc	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.8	6 33.86	33.86	33.86	33.86		(69)
Pumps	s and far	ns gains	(Table 5	āa)									_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					_		_	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.8	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	121.96	119.98	115.87	110.27	106.64	101.53	97.18	102.7	75 104.73	110.52	117.06	119.99		(72)
Total i	internal	gains =	1			(66)	m + (67)m	ı + (68)	m + (69)m +	(70)m + (7	71)m + (72))m		
(73)m=	386.65	384.53	372.3	352.8	333.19	314.31	302.1	307.8	317.9	337.6	360.11	376.81		(73)
6. So	lar gains	S:												
	-		•	r flux from	Table 6a		-	tions to	convert to the	he applica		tion.		
Orient	ation: A	Access F Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
East	0.9x	0.77	X	4.1	6	x 1	9.64	x	0.4	x	0.7	=	15.85	(76)
East	0.9x	0.77	x	4.	8	x 1	9.64	х	0.4	×	0.7	<u> </u>	18.29	(76)
East	0.9x	0.77	x	4.1	6	x 3	8.42	x	0.4	x [0.7	=	31.01	(76)
East	0.9x	0.77	х	4.	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(76)
	<u>L</u>		•	•										_

East	0.9x	0.77	X	4.16	X	6	3.27	X	0.4	X	0.7	=	= [51.07	(76)
East	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	X	0.7	=	= [58.93	(76)
East	0.9x	0.77	X	4.16	X	9	2.28	X	0.4	X	0.7	-	= [74.49	(76)
East	0.9x	0.77	X	4.8	X	9	2.28	X	0.4	X	0.7		- [85.95	(76)
East	0.9x	0.77	x	4.16	X	1	13.09	X	0.4	X	0.7		= [91.29	(76)
East	0.9x	0.77	X	4.8	X	1	13.09	X	0.4	X	0.7		<u> </u>	105.33	(76)
East	0.9x	0.77	x	4.16	X	1	15.77	x	0.4	X	0.7		<u> </u>	93.45	(76)
East	0.9x	0.77	x	4.8	X	1	15.77	x	0.4	X	0.7		- [107.83	(76)
East	0.9x	0.77	X	4.16	X	1	10.22	x	0.4	x	0.7	-	= [88.97	(76)
East	0.9x	0.77	x	4.8	X	1	10.22	x	0.4	X	0.7	-	= [102.66	(76)
East	0.9x	0.77	X	4.16	X	9	4.68	X	0.4	X	0.7	-	<u> </u>	76.42	(76)
East	0.9x	0.77	x	4.8	X	9	4.68	X	0.4	X	0.7		= [88.18	(76)
East	0.9x	0.77	x	4.16	X	7	3.59	x	0.4	X	0.7		<u> </u>	59.4	(76)
East	0.9x	0.77	x	4.8	X	7	3.59	x	0.4	X	0.7		- [68.54	(76)
East	0.9x	0.77	x	4.16	X	4	5.59	X	0.4	X	0.7		= [36.8	(76)
East	0.9x	0.77	x	4.8	X	4	5.59	x	0.4	X	0.7		= [42.46	(76)
East	0.9x	0.77	x	4.16	X	2	4.49	x	0.4	X	0.7		- [19.77	(76)
East	0.9x	0.77	x	4.8	X	2	4.49	Х	0.4	X	0.7	-	- [22.81	(76)
East	0.9x	0.77	x	4.16	x	1	6.15	x	0.4	x	0.7		- [13.04	(76)
East	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	X	0.7		= [15.04	(76)
								7		_			_		
Solar g	ains in	watts, <mark>calcu</mark>	lated	for each mo	nth			(83)m	n = Sum(74)m	.(82)m					
Solar g (83)m=	ains in 3 34.15		1 ated 0.01	for each mo 160.44 196		201.28	191.63	(83)m		. <mark>(82)m</mark> 79.26	_	28.08	3		(83)
(83)m=	34.15	66.8 11	0.01		.62		191.63	`				28.08	3		(83)
(83)m=	34.15	66.8 110	0.01	160.44 196	.62 2)m +		191.63	`	1.6 127.94		42.58	28.08	_		(83) (84)
(83)m= Total g (84)m=	3 <mark>4.15</mark> ains – ir 420.8	66.8 111 nternal and 451.33 48.	0.01 solar 2.31	160.44 196 (84)m = (73	.62 2)m + ((83)m	191.63 , watts	164	1.6 127.94	79.26	42.58	I	_		, ,
(83)m= Total g (84)m= 7. Me	34.15 ains — ir 420.8 an inter	66.8 110 nternal and 3 451.33 483 nal tempera	0.01 solar 2.31 ture (160.44 196 (84)m = (73 513.24 529	.62 2)m + 1 .81 3 son)	(83)m 515.59	191.63 , watts 493.72	164 472	1.6 127.94 .41 445.84	79.26	42.58	I	_	21	, ,
(83)m= Total g (84)m= 7. Me	34.15 ains – ir 420.8 an inter erature	66.8 110 nternal and 451.33 483 nal temperal during heat	o.01 solar 2.31 ture (160.44 196 (84)m = (73 513.24 529 (heating sea	.62 2 .81 5 .80n)	(83)m 515.59 area f	191.63 , watts 493.72	164 472	1.6 127.94 .41 445.84	79.26	42.58	I	_	21	(84)
(83)m= Total g (84)m= 7. Me	34.15 ains – ir 420.8 an inter erature	66.8 110 hternal and a 451.33 483 hal tempera during heat tor for gains	o.01 solar 2.31 ture (160.44 196 (84)m = (73) 513.24 529 (heating seaderiods in the tiving area, h	.62 2 .81 5 .80n)	(83)m 515.59 area f	191.63 , watts 493.72	472 ole 9	1.6 127.94 .41 445.84	79.26	42.58 6 402.69	I	9	21	(84)
(83)m= Total g (84)m= 7. Me	34.15 ains – ir 420.8 an interesture	66.8 110 nternal and 451.33 483 nal temperal during heat tor for gains Feb N	o.o1 solar 2.31 ture (ing pe	160.44 196 (84)m = (73) 513.24 529 (heating seaderiods in the tiving area, h	62 2 .81 5 .80 5 .81 5 .80 7 .81 7 .81 8 .82 8 .83 8 .83 8 .84 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 .85 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	(83)m 515.59 area f	191.63 , watts 493.72 From Tab	472 ole 9	.41 445.84 , Th1 (°C)	79.26	6 402.69 Nov	404.8	9	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	34.15 ains – in 420.8 an inter erature ation fact Jan 0.99	66.8 110 nternal and 3 451.33 483 nal temperal during heat tor for gains Feb N 0.99 0.	o.01 solar 2.31 ture (ing period for li Mar 96	160.44 196 (84)m = (73 513.24 529 (heating seareriods in the ving area, h Apr M	.62 2 .81 4 .80n) living 1,m (say	83)m 515.59 area f see Ta Jun 0.47	191.63 , watts 493.72 From Tab ble 9a) Jul 0.34	164 472 ole 9 A	.41 445.84 , Th1 (°C) ug Sep	79.26 416.8 Oct	6 42.58 6 402.69	404.89	9	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	34.15 ains – in 420.8 an inter erature ation fact Jan 0.99	hternal and a 451.33 48. hal temperal during heat tor for gains Feb M 0.99 0. temperatur	o.01 solar 2.31 ture (ing period for li Mar 96	160.44 196 (84)m = (73 513.24 529 (heating seareriods in the living area, h Apr M 0.86 0.6	.62 2 .81 9 .81 9 .80n) living 1,m (s ay 68	83)m 515.59 area f see Ta Jun 0.47	191.63 , watts 493.72 From Tab ble 9a) Jul 0.34	164 472 ole 9 A	.41 445.84 .Th1 (°C) ug Sep 37 0.59 Table 9c)	79.26 416.8 Oct	42.58 6 402.69 Nov 0.98	404.89	9 [c	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 420.8 an inter erature etion fac Jan 0.99 interna 20.59	66.8 110 Aternal and 451.33 483 Mal temperal during heat tor for gains Feb M 0.99 0.00 I temperatur 20.68 200	o.01 solar 2.31 ture (ing personal for lime 196 e in l	160.44 196 (84)m = (73 513.24 529 (heating seareriods in the living area, h	.62 2 .81 9 .81 9 .81 9 .81 9 .81 9 .83 9 .84 99	83)m 515.59 area f see Ta Jun 0.47 ow ste	191.63 , watts 493.72 From Tak ble 9a) Jul 0.34 ps 3 to 7	164 472 ole 9 Al 0.3 7 in T	.41	79.26 416.8 Oct 0.89	42.58 6 402.69 Nov 0.98	Dec 1	9 [c	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp	34.15 ains – in 420.8 an inter erature etion fac Jan 0.99 interna 20.59	hternal and a 451.33 483 483 483 483 483 483 483 483 483 4	o.01 solar 2.31 ture (ing personal for lime 196 e in l	160.44 196 (84)m = (73 513.24 529 (heating seareriods in the living area, h	.62 2 .81 5 .81 5 .80n) living 1,m (s ay 6 .8 1 (follows)	83)m 515.59 area f see Ta Jun 0.47 ow ste	191.63 , watts 493.72 From Tak ble 9a) Jul 0.34 ps 3 to 7	164 472 ole 9 Al 0.3 7 in T	.41	79.26 416.8 Oct 0.89	42.58 6 402.69 Nov 0.98	Dec 1	9 [C	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ains – in 420.8 an interesture erature Ution face Jan 0.99 interna 20.59 erature 20.42	hternal and a second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second and second a	solar 2.31 ture (ing po for li Mar 96 ee in l 0.81 ing po	160.44 196 (84)m = (73 529 513.24 529 (heating seareriods in the eving area, has a property of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving area of the eving a	.62 2 .81 5 .81 5 .81 5 .81 5 .81 5 .81 (follo	area for see Ta Jun 0.47 ow ste 21 welling 20.46	191.63 , watts 493.72 From Table 9a) Jul 0.34 ps 3 to 7 21 from Table 9a	164 472 472 All 0.3 7 in T 2 able 9	.41	79.26 416.8 Oct 0.89	42.58 6 402.69 Nov 0.98	Dec 1 20.58	9 [C	21	(84) (85) (86) (87)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	an interest an internation factors and the second states and the second states and the second states and the second states and the second states and the second states are second states and the second states and the second states are second states and the second states are second states and the second states are second states and the second states are second states and the second states are second states and the second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second states are second 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second states are second states are second states are second states are second states are second stat	hternal and a second and temperal during heat tor for gains Feb Mo.99 0.91 temperatur 20.68 20 during heat 20.43 20 tor for gains	ture (ing positions of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the interest of the 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Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of the Eving area of th	son) living 1,m (s ay 1 (follo 99 44 welling 44 liwelling	83)m area f see Ta Jun 0.47 ow ste 21 welling 20.46 2,m (se 0.43 g T2 (fo 20.46	191.63 , watts 493.72 From Table 9a) Jul 0.34 ps 3 to 7 21 from Table 20.46 ee Table 0.3 collow ste 20.46	164 472 472 ble 9 0.3 7 in T 2 9a) 0.3 20. + (1 20.	.41	79.26 416.8 Oct 0.89 20.94 20.44 0.86 9c) 20.38 A = Li ¹	1 42.58 1 42.58 1 42.58 2 1 42.58 3 42.58 4 102.69 3 20.76 4 20.76 4 20.44 5 0.98 2 20.13 2 20.39	Dec 1 20.58 20.43 0.99	9 [2 3 3 7		(84) (85) (86) (87) (88) (89)

	T	l	l									ı	(00)
(93)m= 20.17	20.28	20.45	20.62	20.67	20.68	20.68	20.68	20.68	20.61	20.39	20.16		(93)
8. Space hea				ro obtair	and at et	on 11 of	Table 0	n so tha	t Ti m-(76)m an	d ro-calc	vulato	
the utilisation			•		icu ai sii	ър птог	i abic 3i	J, 50 II Ia		r Ojili ali	u ie-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	1:									•	
(94)m= 0.99	0.98	0.95	0.84	0.66	0.45	0.32	0.34	0.57	0.87	0.98	0.99		(94)
Useful gains	1	· `	r `	r									(05)
(95)m= 417.09		458.94	433.27	347.94	232.05	155.78	162.64	252.94	362.41	393.04	402.1		(95)
Monthly ave	rage exte	ernai tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	<u> </u>									7.1	4.2		(50)
(97)m= 645.83	i	562.13	460.86	350.99	232.14	155.78	162.65	253.6	391.95	525.37	637.24		(97)
Space heatir	<u> </u>	l .	l .		l					1)m	<u> </u>		
(98)m= 170.18	Ť	76.78	19.87	2.27	0	0	0	0	21.98	95.27	174.95		
				!	!		Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	681.96	(98)
Space heatir	ng require	ement in	kWh/m²	²/year								10.18	(99)
9b. Energy re	guiremer	nts – Coi	mmunitv	heating	scheme								
This part is us	•		· ·	Ĭ			tina prov	ided by	a comm	unitv sch	neme.		_
Fraction of sp										, , , , ,		0	(301)
Fraction of sp	ace heat	from co	<mark>mmu</mark> nity	y syste <mark>m</mark>	1 - (30	1) =						1	(302)
The community s includes boilers,									up to four	other heat	sources; ti	he latter	
Fraction of he					iom pomo	olatione.	occ / ippor	IGIA O.				1	(303a)
Fraction of tot	al space	heat fro	m Comr	nunity he	eat pumr				(3	02) x (303	a) =	1	(304a)
Factor for cor							unity hea	iting sys		, (333		1	(305)
Distribution lo	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	a											kWh/yea	 r
Annual space	_	requiren	nent									681.96	
Space heat fr	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	716.06	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	g require	ment fro	m secon	ıdary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heatin	q												
Annual water	_	equirem	ent									1791.08	
If DHW from o		•)				(64) x (30	03a) x (30	5) x (306) :	=	1880.63	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	25.97	(313)
Cooling Syste				0								0	(314)
Space cooling	g (if there	is a fixe	ed coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for	,					,							
mechanical ventilation - balanced, extract or positive input from outside													
											'		_

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	119.54	(331)
Energy for lighting (calculated in Appendix L)			334.24	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	2532.29	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor	r 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 fu	uel 256	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.52	526.44	(367)
Electrical energy for heat distribution	(313) x	0.52	= 13.48	(372)
Total CO2 associated with community systems	363)(366) + (368)(372	2)	= 539.91	(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	0.22	= 0	(375)
Total CO2 associated with space and water heating	373) + (374) + (375) =		539.91	(376)
CO2 associated with electricity for pumps and fans within dwelling	ng (331)) x	0.52	62.04	(378)
CO2 associated with electricity for lighting	332))) x	0.52	173.47	(379)
Energy saving/generation technologies (333) to (334) as applica	ble	0.04		_
Item 1		0.52 x 0.01 =	-268.93	(380)
Total CO2, kg/year sum of (376)(382) =			506.5	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			7.56	(384)
El rating (section 14)			93.94	(385)

		User Detai	ls:					
Assessor Name: Software Name:	Stroma FSAP 2012		oma Num ftware Ve	rsion:		Versic	n: 1.0.5.51	
Address :		Froperty Add	ress. Sampl	e 5 (Mia)				
1. Overall dwelling dime	nsions:							
0 10		Area(m		Av. He	ight(m)	٦	Volume(m ³	<u> </u>
Ground floor		67	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 67	(4)					
Dwelling volume			(3a)+(3b	o)+(3c)+(3d	l)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:								
	main seconda heating heating	ry oth	er	total			m³ per hou	ır
Number of chimneys	0 + 0	+ (=	0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	+ (0	x	20 =	0	(6b)
Number of intermittent fa	ns			2	х	10 =	20	(7a)
Number of passive vents			Ė	0	x	10 =	0	(7b)
Number of flueless gas fi	res			0	χ.	40 =	0	(7c)
							anges per ho	
	ys, flues and fans = (6a)+(6b)+ een carried out or is intended, proce			20 (0) to (÷ (5) =	0.1	(8)
Number of storeys in the		ed to (17), other	wise continue in	10111 (9) to (10)		0	(9)
Additional infiltration					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber frame o	or 0.35 for ma	sonry const	ruction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding	to the greater wa	all area (after					
•	loor, enter 0.2 (unsealed) or (0.1 (sealed),	else enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0						0	(13)
Percentage of windows	s and doors draught stripped						0	(14)
Window infiltration			- [0.2 x (14) ÷	-			0	(15)
Infiltration rate			(10) + (11) + (0	(16)
•	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20] +$		•	netre of e	nvelope	area	5	(17)
·	s if a pressurisation test has been do			is beina u:	sed		0.35	(18)
Number of sides sheltere		mo or a aogree	an pormodomiy	io soing at	304		3	(19)
Shelter factor		(20)	= 1 - [0.075 x (19)] =			0.78	(20)
Infiltration rate incorporat	ing shelter factor	(21)	= (18) x (20) =				0.27	(21)
Infiltration rate modified for	or monthly wind speed							
Jan Feb	Mar Apr May Jun	Jul A	ug Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7	,				,	•	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8 3	.7 4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4							
	1.23 1.1 1.08 0.95	0.95 0.	92 1	1.08	1.12	1.18		
·				1	<u> </u>		I	

0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32]	
alculate effec		-	rate for t	he appli	cable ca	se		!		!	!	<u>.</u>	
If mechanical If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	auation (N	J5)) othe	rwica (23h) = (23a)			0	
If balanced with) = (23a)			0	
		-	-	_					Dls \ /	005) [4 (00-)	0)
a) If balance	a mecn	anicai ve	ntilation	with ne	at recove		1R) (248	$\frac{1}{1} = \frac{2}{2}$	2b)m + (0	23b) × [$\frac{1 - (23c)}{0}$) ÷ 100]]	
	_											J	
b) If balance	o mech	o o	0	without 0	0	overy (i	0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (22)$	0	230)	0	1	
							<u> </u>		0			J	
c) If whole h if (22b)n				•	•				5 x (23h))			
4c)m= 0	0.07	0	0	0	0	0	0	0	0 7 (20)	0	0]	
d) If natural	ventilatio	n or wh	ole hous			ventilatio	<u> </u>					J	
if (22b)n				•	•				0.5]				
4d)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)		•	•	-	
5)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		
Hoot loose	a and he	ot loca i	o comot	or:									
. Heat losse					Net Ar	00	U-valı	110	AXU		k volu	_	ΑXk
LEMENT	Gros area		Openin m		A,r		W/m2		(W/	K)	k-value kJ/m²-		kJ/K
oors					2.4	x	1	= [2.4	Ė.			
/in <mark>dows</mark> Type	1				4.16	x1.	/[1/(1.4)+	0.04] =	5.52	Ħ			
/indows Type	2				4.8	x1.	/[1/(1.4)+	0.04] =	6.36	Ħ			
/alls Type1	29.	4	8.96		20.44	x	0.18	=	3.68	Ħ r		¬ ₹	
/alls Type2	12		2.4		9.6	X	0.18	<u> </u>	1.73	=		=	
/alls Type3	2.4		0			x				륵 ¦		ᆿ 누	
otal area of e					2.44	=	0.18		0.44	[
or windows and			offective wi	ndow I I-va	43.84		ı formula 1	/[(1/ ₋ valı	د 0.41 (مر	as aiven in	naragrani	h 3 2	
include the area						ateu using	TOTTIUIA T	/[(1/ O -vaic	0-7+0.0 4] 6	is given in	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				20.	13
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	454	.72
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	50
or design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
n be used inste						_							
nermal bridge	•	,		• .	-	<						2.1	19
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =				32
entilation hea		alculator	l monthly	,						[25)m x (5]	١	22.	32
Jan	Feb	Mar	Apr	May	Jun	Jul	Διια	Sep	Oct	Nov	Dec	1	
8)m= 37.12	36.97	36.82	36.11	35.98	35.36	35.36	Aug 35.25	35.6	35.98	36.24	36.52	1	
		<u> </u>			1	1 20.00	1 00.20				1 30.02	J	
eat transfer o		r	F0. / 2	F0.55		F7.55		· · ·	= (37) + (<u> </u>		1	
9)m= 59.44	59.28	59.13	58.43	58.29	57.68	57.68	57.56	57.92	58.29	58.56	58.84	1	

Heat loss para	meter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.89	0.88	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.87	0.88		
		!					!		L—————————————————————————————————————	Sum(40) ₁ .	12 /12=	0.87	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu											17		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13	.9)			
Annual averag											.76		(43)
Reduce the annua not more that 125	_				-	-	to achieve	a water us	se target o	of Total			
							T .		_		I _ 1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in							· <i>'</i>						
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		_
Energy content of	hot water	used - cal	culated mo	onthly – 4	190 x Vd r	пуптуГ	Tm / 3600			m(44) ₁₁₂ =		1029.18	(44)
									_				
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49	4040 44	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		10tal = 5u	m(45) ₁₁₂ =	=	1349.41	(43)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage		10.54	10.51	15.04	13.07	12.07	14.54	14.71	17.15	10.72	20.02		(10)
Storage volum		includir	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	ınd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	_			_				ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufact			-										
Hot water stora	-			e 2 (KW	n/litre/da	ıy)					0		(51)
If community h Volume factor	_		on 4.3								0		(52)
Temperature fa			2h								0		(52)
Energy lost fro				oor			(47) x (51)) v (52) v (53) –				` '
Enter (50) or (-	, KVVII/yt	Jai			(47) X (01)) X (02) X (00) =		0 75		(54) (55)
Water storage	, ,	,	or each	month			((56)m = (55) v (41):	m	0.	73		(00)
					00.50	i			ī	T 00.50	00.00		(EC)
(56)m= 23.33 If cylinder contains	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	iv Ll	(56)
	dedicate	u solai sio			x [(30) – (· · · · · · · · · · · · · · · · · · ·	u), eise (5	<i>i</i>	ııı wilele (<u>, </u>	пп Аррепа		
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by						ı —				- 			/==·
(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 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		(61)
Total h	neat req	uired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		(62)
Solar DI	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	•	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
		-		-		-	-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	ıde (57)	m in cal	culation o	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. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	s (Table	5), Wat	ts									_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	<mark>ig g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	18.37	16.32	13.27	10.05	7.51	6.34	6.85	8.91	11.95	15.18	17.72	18.89		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	s and fa	ns gains	(Table 5	 5a)		-	-	-		-	-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	/aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)				=	=		=	=			
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65		(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$														
(73)m=	379.77	377.7	365.57	346.16	326.63	307.78	295.56	301.21	311.21	330.81	353.25	369.91		(73)
6. So	lar gains	s:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat		ion.		
Orient		Access F		Area		Flu		-	g_ 	_	FF		Gains	
	ļ	Table 6d		m²			ole 6a	. <u> </u>	able 6b		able 6c		(W)	_
East	0.9x	0.77	х	4.1	6	x 1	9.64	х	0.63	x	0.7	=	24.97	(76)
East	0.9x	0.77	х	4.8	3	x 1	9.64	х	0.63	x	0.7	=	28.81	(76)
East	0.9x	0.77	Х	4.1	6	x 3	88.42	X	0.63	x	0.7	=	48.85	(76)
East	0.9x	0.77	X	4.8	3	x 3	88.42	X	0.63	X	0.7	=	56.36	(76)

	_		_					_						
East	0.9x	0.77	X	4.16		x	63.27	X	0.63	X	0.7	=	80.44	(76)
East	0.9x	0.77	X	4.8		x	63.27	×	0.63	X	0.7	=	92.82	(76)
East	0.9x	0.77	X	4.16		x	92.28	X	0.63	X	0.7	=	117.32	(76)
East	0.9x	0.77	X	4.8		x	92.28	X	0.63	X	0.7	=	135.37	(76)
East	0.9x	0.77	X	4.16	;	x	113.09	X	0.63	X	0.7	=	143.78	(76)
East	0.9x	0.77	X	4.8		x	113.09	X	0.63	х	0.7		165.9	(76)
East	0.9x	0.77	X	4.16		x	115.77	X	0.63	x	0.7		147.18	(76)
East	0.9x	0.77	X	4.8		x	115.77	X	0.63	X	0.7		169.83	(76)
East	0.9x	0.77	X	4.16		x	110.22	X	0.63	X	0.7		140.13	(76)
East	0.9x	0.77	X	4.8		x	110.22	X	0.63	х	0.7		161.68	(76)
East	0.9x	0.77	X	4.16		x	94.68	X	0.63	X	0.7		120.37	(76)
East	0.9x	0.77	X	4.8		x	94.68	X	0.63	X	0.7		138.88	(76)
East	0.9x	0.77	X	4.16		x	73.59	X	0.63	x	0.7		93.56	(76)
East	0.9x	0.77	X	4.8		x	73.59	X	0.63	X	0.7		107.95	(76)
East	0.9x	0.77	X	4.16	\equiv	x	45.59	X	0.63	x	0.7	╡ =	57.96	(76)
East	0.9x	0.77	x	4.8		x	45.59	X	0.63	x	0.7		66.88	(76)
East	0.9x	0.77	x	4.16		x	24.49	X	0.63	x	0.7		31.13	(76)
East	0.9x	0.77	X	4.8		×	24.49	Х	0.63	Х	0.7	=	35.92	(76)
East	0.9x	0.77	x	4.16	$ egilination = \frac{1}{2} \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left(\frac{1}{2} \right) \left($	х	16.15	x	0.63	x	0.7	=	20.53	(76)
East	0.9x	0.77	X	4.8		х	16.15	ቫ 	0.63	X	0.7	_	23.69	(76)
Last														
Last														
	ains in	watts, calcu	lated	for each	month	1		(83)m	n = Sum(74)m	(82)m				
	pains in 53.78		lated		month 309.68		17.01 301.81	(83)m	n = Sum(74)m	(82)m		44.23		(83)
Solar (83)m=	53.78		3.26	252.69	309.68	3	17.01 301.81	`	n = Sum(74)m	1 '		44.23		(83)
Solar (83)m=	53.78	105.21 17 nternal and	3.26	252.69 (84)m = (309.68	+ (8	17.01 301.81	259	n = Sum(74)m 0.25 201.51	1 '	4 67.06	44.23		(83)
Solar (83)m= Total g	53.78 ains – ir 433.55	105.21 17 nternal and	3.26 solar 8.83	252.69 (84)m = (598.85	309.68 (73)m 636.31	+ (8	17.01 301.81 33)m , watts	259	n = Sum(74)m 0.25 201.51	124.8	4 67.06	<u> </u>		, ,
Solar (83)m= Total g (84)m=	53.78 ains — ir 433.55 an inter	105.21 17 nternal and 482.91 53 nal tempera	3.26 solar 8.83 ture (252.69 : (84)m = (598.85 (heating s	309.68 (73)m 636.31) + (8	17.01 301.81 33)m , watts	560	n = Sum(74)m 0.25 201.51 0.46 512.71	124.8	4 67.06	<u> </u>		, ,
Solar (83)m= Total (84)m= 7. Me	53.78 ains – ir 433.55 an interesture	105.21 17 nternal and 482.91 53 nal tempera during heat	3.26 solar 8.83 ture (252.69 : (84)m = (598.85 (heating seriods in t	309.68 (73)m 636.31 seasor the liv	+ (8 h)	17.01 301.81 33)m , watts 24.8 597.37	560 able 9	n = Sum(74)m 0.25 201.51 0.46 512.71	124.8	4 67.06	<u> </u>		(84)
Solar (83)m= Total (84)m= 7. Me	53.78 ains – ir 433.55 an interesture	105.21 17 nternal and 482.91 53 nal tempera during heat tor for gains	3.26 solar 8.83 ture (252.69 : (84)m = (598.85 (heating seriods in t	309.68 (73)m 636.31 seasor the liv	+ (8 6 n) ing :	17.01 301.81 33)m , watts 24.8 597.37 area from Ta	560 able 9	n = Sum(74)m 0.25 201.51 0.46 512.71	124.8	4 67.06	<u> </u>	21	(84)
Solar (83)m= Total (84)m= 7. Me	53.78 ains – in 433.55 an inter erature ation fac	105.21 17 Internal and 482.91 53 Inal temperal during heat stor for gains Feb N	solar 8.83 ture (ing pe	252.69 : (84)m = (598.85 (heating seriods in the diving area	309.68 (73)m 636.31 seasor the liv a, h1,n	+ (8 n) ing a	17.01 301.81 33)m , watts 24.8 597.37 area from Ta	560 able 9	n = Sum(74)m 0.25 201.51 0.46 512.71 , Th1 (°C) ug Sep	124.8	4 67.06	414.14	21	(84)
Solar (83)m= Total (84)m= 7. Me Temp Utilisa (86)m=	53.78 ains – in 433.55 an inter erature ation face Jan 1	105.21 17 nternal and 482.91 53 nal tempera during heat tor for gains Feb 1 0.99 0	solar 8.83 ture (ing pe s for li	252.69 : (84)m = (598.85 (heating seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in the seriod in	309.68 (73)m 636.31 seasor the liv a, h1,n May 0.79	+ (8 n) ing and (se	17.01 301.81 33)m , watts 24.8 597.37 area from Ta ee Table 9a) Jun Jul 0.58 0.42	259 560 able 9 A	n = Sum(74)m 0.25 201.51 0.46 512.71 , Th1 (°C) ug Sep 47 0.74	124.8 455.6	4 67.06 4 420.3	414.14 Dec	21	(84)
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Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.97 0.9 0.75 0.54 0.38 0.42 0.69 0.94 0.99 1 Useful gains, hmGm, W = (94)m x (84)m (95)m= 431.21 477.56 522.62 541.28 479.47 338.28 226.29 237.09 356.27 426.58 415.27 412.42 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)] (97)m= 905 876.57 795.67 664.72 510.92 341.61 226.58 237.66 362.54 745.78 900.25 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 352.5 268.14 203.15 88.88 23.4 0 0 0 0 101.15 237.97 362.95 Total per year (kWh/year) = Sum(98)492 = 1638.13 (98) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (202) x [1 - (203)] = 1 (204)									
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(95)m=									
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Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 $(202) = 1 - (201) =$ $(202) \times [1 - (203)] =$ $(204) = (202) \times [1 - (203)] =$									
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)									
2. Indianal of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the									
Efficiency of secondary/supplementary heating system, %									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above)									
352.5 268.14 203.15 88.88 23.4 0 0 0 101.15 237.97 362.95									
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $									
Space heating fuel (secondary), kWh/month = $\{[(98)m \times (201)]\} \times 100 \div (208)$									
(215)m = 0									
Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)									
Water heating									
Output from water heater (calculated above)									
186.5 164.45 172.86 155.17 152.22 136.24 131.06 143.52 143.17 160.9 169.86 182.09									
Efficiency of water heater 79.8 (216)									
(217)m= 86.49 86.11 85.25 83.39 81.08 79.8 79.8 79.8 83.62 85.71 86.62 (217)									
Fuel for water heating, kWh/month									
$(219) m = (64) m \times 100 \div (217) m$ $(219) m = (64) m \times 100 \div (217) m$ $(219) m = (64) m \times 100 \div (217) m$									
(219)m= 215.64 190.97 202.78 186.08 187.75 170.73 164.23 179.84 179.41 192.42 198.17 210.21									
$Total = Sum(219a)_{112} = 2278.25 $ $LVMb (vector)$									
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 1752.01									
1702.01									

Water heating fuel used				2278.25	1				
Electricity for pumps, fans and electric keep-hot									
central heating pump:			30]	(230c)				
boiler with a fan-assisted flue			45]	(230e)				
Total electricity for the above, kWh/year	sum of (230a	75	(231)						
Electricity for lighting				324.5	(232)				
Total delivered energy for all uses (211)(221) + (4429.75	(338)							
12a. CO2 emissions – Individual heating systems including micro-CHP									
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır				
Space heating (main system 1)	(211) x	0.216	=	378.43	(261)				
Space heating (secondary)	(215) x	0.519	=	0	(263)				
Water heating	(219) x	0.216	=	492.1	(264)				
Space and water heating	(261) + (262) + (263) + (264) =			870.54	(265)				
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)				
Electricity for lighting	(232) x	0.519	=	168.41	(268)				
Total CO2, kg/year TER =	sum	of (265)(271) =		16.09	(272)				

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2019 Year Completed:

Floor Location: Floor area:

Storey height: 55.1 m² Floor 0 3 m

26 m² (fraction 0.472) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
DOOR	<u>Manufacturer</u>	Solid			Wood
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
Ralcony	Manufacturer	Windows	low_F En $= 0.05$ soft coat	. No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	4.16	1
Б. 1		0.7	0.4		4.0	

Balcony 0.7 0.4 1 4.8 1 Width: Type-Name: Location: Height: Name: Orient:

DOOR INT Worst case 0 W W West 0 0 Balcony W West 0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
W	24	8.96	15.04	0.15	0	False	N/A
INT	24	2.4	21.6	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Internal Flomen	te						

<u>Internal Elements</u> Party Elements

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Yes (As designed) Pressure test:

SAP Input

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary neating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901 Fuel :mains gas

No hot water cylinder
Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester

Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

		_ l loon	Dotoile: -						
		User	Details:		_				
Assessor Name:			Strom				., .	40554	
Software Name: S	troma FSAP 2012	Duanant	Softwa				Version	on: 1.0.5.51	
Address		Property	Address:	Sample	e 6 (IVIId)				
Address: 1. Overall dwelling dimension	nns:								
1. Overall awelling aimener	лю.	Are	ea(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor				(1a) x		3	(2a) =	165.3	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+	(1n)	55.1	(4)			J		
Dwelling volume		` ′	00.1		o)+(3c)+(3c	d)+(3e)+	.(3n) =	165.3	(5)
				(33) (33	, (33)	., (==)		100.3	
2. Ventilation rate:	main seco		other		total			m³ per hou	ır
Number of chimneys	heating heati		0	л ₌ г	0	x 4	40 =	0	(6a)
•		<u></u>]			20 =		╡` ′
Number of open flues	0 + (·	0] - [0			0	(6b)
Number of intermittent fans					0	x ′	10 =	0	(7a)
Number of passive vents					0	X '	10 =	0	(7b)
Number of flueless gas fires					0	X 4	40 =	0	(7c)
							A in ak	angos nor h	011F
				_		_		nanges per he	_
Infiltration due to chimneys, f				antinuo fi	0		÷ (5) =	0	(8)
Number of storeys in the d		oceed to (17)	, otrierwise t	oriunde ii	10111 (9) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timber fram	e or 0.35 f	or masonr	y const	ruction			0	(11)
if both types of wall are preser		ing to the gre	ater wall are	a (after					
deducting areas of openings); If suspended wooden floor		or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, enter (,	o. o (ooa	,,					0	(13)
Percentage of windows an		ed						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
Air permeability value, q50	•	-	•	•	etre of e	envelope	area	3	(17)
If based on air permeability v								0.15	(18)
Air permeability value applies if a Number of sides sheltered	pressurisation test has bee	n done or a d	egree air pe	rmeability	is being u	sed			(40)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.78	(19) (20)
Infiltration rate incorporating	shelter factor		(21) = (18)) x (20) =				0.12	(21)
Infiltration rate modified for m								02	` ′
Jan Feb Mai	r Apr May J	un Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind speed	from Table 7	•	•			•	•	_	
$ (22)m = \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4.4 4.3 3	.8 3.8	3.7	4	4.3	4.5	4.7]	
			•		•	•	•	-	
Wind Factor $(22a)m = (22)m$		05 0.05	0.00		1 4 00			1	
(22a)m= 1.27 1.25 1.23	1.1 1.08 0.	95 0.95	0.92	1	1.08	1.12	1.18	J	

0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14]	
alculate effe		-	rate for t	he appli	cable ca	se	•	•	•	•	•	<i>.</i>	
If mechanica			andiv NL (O	12h) (22	s) Fm; //	aguatian (I	VEVV otho	muiaa (22h	\ (225\			0.5	(2:
If exhaust air he		0 11		, ,	,	. `	,, .	,) = (23a)			0.5	(23
If balanced with		-	-	_					51.) (·	001) [4 (00.)	79.05	(2:
a) If balance						- ` ` 	- ´ ` -	ŕ	 		- ` ´	i ÷ 100] 1	(24
1a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	J	(2
b) If balance				ı —			- ^ ` ` 	í `	 	 	Ι ,	1	(2
1b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(2
c) If whole h if (22b)n					•				5 v (22h	.)			
1 (220)11 1c)m= 0	0.5 x	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0 × (230	0	0	1	(2
-/									U	0		J	(2
d) If natural if (22b)n				•	•				0.5]				
1d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	· (25)		<u>I</u>		1	
5)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	1	(2
						I							
. Heat losse													
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	()	k-value kJ/m²-		A X k kJ/K
oors	a. oa	()			2.4	x	1.4	= [3.36	·,	,,,,,		(2
in <mark>dows</mark> Type	1				4.16	=	1/[1/(1)+		4	Ħ			(2
indows Type							1/[1/(1)+	L L		Ħ			(2
				\	4.8				4.62	븍 ,			<u> </u>
alls Type1	24		8.96		15.04	=	0.15	=	2.26	닠 ¦		╛╠	(2
alls Type2	24		2.4	_	21.6	X	0.15	=	3.23	닠 !		⊣	(2
alls Type3	2.4		0		2.4	X	0.35	=	0.84				(2
otal area of e	lements	, m²			50.4								(3
or windows and include the area						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	1 3.2	
abric heat los				is and par	แนบกร		(26)(30)) + (32) =				18.3	(3
eat capacity		,	0)				(-) ()		.(30) + (32	2) + (32a)	(32e) =		(3
ear capacity nermal mass		. ,	2 – Cm =	_ ΤΕΔ\ ir	n k I/m²K				tive Value:	, , ,	(020) =	546.56	(3
r design assess	•	,		,			ecisely the				ahle 1f	250	(
n be used inste				CONSTRUCT	ion are no	i kilowii pi	colsoly the	maidanvo	values of	11011 111 10	ubic 11		
nermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	K						7.56	(3
letails of therma		are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he	at loss							(33) +	(36) =			25.86	(3
entilation hea	t loss ca	alculated	monthly	У				(38)m	= 0.33 × (25)m x (5))	1	
1	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan													
Jan 13.8	13.64	13.48	12.69	12.53	11.74	11.74	11.58	12.06	12.53	12.85	13.17]	(3
			12.69	12.53	11.74	11.74	11.58	<u> </u>	12.53 = (37) + (3	<u> </u>	13.17]	(3

eat ic	ss para	meter (F	ILP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m=	0.72	0.72	0.71	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.7	0.71		
umba	r of dov	a in mar	oth /Tab	lo 1o\					1	Average =	Sum(40) ₁ .	12 /12=	0.7	(4
umbe 	Jan	Feb	nth (Tab Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	Apr 30	31	30	31	31	30 30	31	30	31		(4
. ,–			0.	- 00	0.		<u> </u>			<u> </u>		<u> </u>		(-
1 Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ar.	
				romont.										
if TF.				[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (ΓFA -13.		84		(4
educe	the annua	l average	hot water	usage by	5% if the a	lwelling is	designed t	(25 x N) to achieve		se target o		.91		(4
t more I				day (all w						1				
ot wate	Jan	Feb	Mar	Apr ach month	May	Jun	Jul Table 10 X	Aug	Sep	Oct	Nov	Dec		
	- I													
4)m=	85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7	024.00	— ,
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		934.88	(4
5)m=	127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
									-	L Total = Su	m(45) ₁₁₂ =		1225.78	(4
nstant	aneous w	ater he <mark>ati</mark> i	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)			,		
6)m=	19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(4
	storage		, , ,,			1144 IDO								
								within sa	ame ves	sei		0		(4
	-	_		nk in dw	_			(47) mbi boil	ore) onto	or 'Ω' in <i>(</i>	47)			
	storage		not wate	i (uno m	iciuues i	nstantai	16003 00	ilibi boli	craj crite	51 0 111 (71)			
	_		eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(-
mpe	rature fa	actor fro	m Table	2b								0		(4
ergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(
				ylinder l								'		
		•		om Tabl	e 2 (kWl	h/litre/da	ıy)				0.	02		(
	-	eating s from Tal	ee sectio	on 4.3								00		,
			m Table	2b							-	.6		()
•				, kWh/ye	ar			(47) x (51)) x (52) x (53) =		03		(
٠,		54) in (5	•	, 10011/90	Zai			(11) X (01)	/ X (OL) X (00) –		03		(+
	. , .	, ,	•	or each	month			((56)m = (55) × (41)ı	m				·
s)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
												m Appendi	ix H	(
')m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
,						1 00.00		02.01			<u> </u>			·
	v circuit	loss (an	nual) fro	ım Tahle	3.						1	0 I		(5
		•	•			E0\~ '	(EO) . OC	E /44\	m					`
mar	y circuit	loss cal	culated f	for each	month (•	. ,	65 × (41) ng and a		r thermo				`

Comb	i loss ca	lculated	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 I	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.36	161.08	169.97	153.49	151.23	136.29	132	143.32		159.11	166.83	178.35		(62)
Solar D	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	16.59	14.71	15.14	13.33	12.81	11.05	10.22	11.77	11.91	13.81	14.97	16.12	•	(63) (G2)
Outpu	t from w	ater hea	ter											
(64)m=	163.1	143.95	152.16	137.57	135.73	122.64	119.09	128.87	7 128.08	142.61	149.26	159.55		
		•				•		Ot	utput from wa	ater heate	r (annual)₁	12	1682.61	(64)
Heat o	gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	86.48	76.9	82.36	76.04	76.12	70.32	69.73	73.5	72.42	78.74	80.48	85.14		(65)
inclu	ude (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	ıs (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>tir</mark>	ng gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.29	13.58	11.05	8.36	6.25	5.28	5.7	7.41	9.95	12.63	14.74	15.72		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			•	
(68)m=	160.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooki	ng gains	(calcula	ted in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5			'	
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pump:	s and fa	ns gains	(Table 5	Ба)					•	!			ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (negat	ive valu	es) (Tab	le 5)			•	•	•		1	
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	[(71)
Water	heating	gains (T	able 5)						•				ı	
(72)m=	116.23	114.43	110.7	105.62	102.32	97.67	93.73	98.78	100.58	105.84	111.78	114.44		(72)
Total	internal	gains =				(66)	m + (67)m	+ (68)n	n + (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m=	342.57	340.73	330.26	313.56	296.88	280.66	270.06	275.17	7 283.69	300.57	319.89	334.13		(73)
6. So	lar gains	S:												
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu			g _	_	FF		Gains	
		Table 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
West	0.9x	0.77	X	4.1	6	x 1	9.64	х	0.4	x	0.7	=	15.85	(80)
West	0.9x	0.77	X	4.8	8	x 1	9.64	х	0.4	x	0.7	=	18.29	(80)
West	0.9x	0.77	X	4.1	6	x 3	8.42	x	0.4	x	0.7	=	31.01	(80)
West	0.9x	0.77	X	4.8	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(80)

	_		_					_						
West	0.9x	0.77	X	4.16	Х	6	3.27	X	0.4	x	0.7	=	51.07	(80)
West	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	x	0.7	=	58.93	(80)
West	0.9x	0.77	X	4.16	X	9	2.28	X	0.4	X	0.7	=	74.49	(80)
West	0.9x	0.77	X	4.8	X	9	2.28	X	0.4	x	0.7	=	85.95	(80)
West	0.9x	0.77	X	4.16	X	1	13.09	x	0.4	X	0.7	=	91.29	(80)
West	0.9x	0.77	X	4.8	X	1	13.09	x	0.4	X	0.7	=	105.33	(80)
West	0.9x	0.77	x	4.16	x	1	15.77	x	0.4	X	0.7	=	93.45	(80)
West	0.9x	0.77	x	4.8	x	1	15.77	X	0.4	x	0.7	=	107.83	(80)
West	0.9x	0.77	x	4.16	X	1	10.22	x	0.4	x	0.7	=	88.97	(80)
West	0.9x	0.77	x	4.8	x	1	10.22	x	0.4	X	0.7	=	102.66	(80)
West	0.9x	0.77	x	4.16	x	9	4.68	X	0.4	x	0.7	=	76.42	(80)
West	0.9x	0.77	x	4.8	X	9	4.68	x	0.4	x	0.7	=	88.18	(80)
West	0.9x	0.77	x	4.16	X	7	3.59	x	0.4	x	0.7	=	59.4	(80)
West	0.9x	0.77	x	4.8	x	7	3.59	X	0.4	x	0.7	=	68.54	(80)
West	0.9x	0.77	x	4.16	X	4	5.59	X	0.4	X	0.7	=	36.8	(80)
West	0.9x	0.77	x	4.8	x	4	5.59	x	0.4	x	0.7	=	42.46	(80)
West	0.9x	0.77	X	4.16	X	2	4.49	X	0.4	X	0.7	=	19.77	(80)
West	0.9x	0.77	x	4.8	X	2	4.49	Х	0.4	X	0.7	=	22.81	(80)
West	0.9x	0.77	x	4.16	x	1	6.15	x	0.4	X	0.7		13.04	(80)
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	Х	0.7		15.04	(80)
								7						
		wotto colou	otod	for each m	onth			(83)m	n = Sum(74)m	(82)m				
Solar g	ains in	walls, calcu	aleu	TOT GACITITI	OHUI			(00)11	1 – Sum(74)11	.(02)111			_	
Solar g (83)m=	34.15).01			201.28	191.63	164		79.26		28.08		(83)
(83)m=	34.15		0.01	160.44 19	6.62			`			_	28.08		(83)
(83)m=	34.15	66.8 110	0.01	160.44 19 (84)m = (73	6.62 3)m +			`	1.6 127.94		42.58	28.08 362.21]	(83) (84)
(83)m= Total g	3 <mark>4.15</mark> ains – ir 376.72	66.8 110	0.01 solar 0.27	160.44 19 (84)m = (73 474 49	3)m +	(83)m	, watts	164	1.6 127.94	79.26	42.58]	` ,
(83)m= Total g (84)m= 7. Mea	3 <mark>4.15 ains — ir 376.72 an inter</mark>	66.8 111 nternal and 407.53 44	0.01 solar 0.27 ture (160.44 19 (84)m = (73) 474 49 (heating sea	3)m + 93.5 ason)	(83)m 481.94	, watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58		21	` ,
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter	66.8 110 nternal and 3 407.53 440 nal tempera	o.01 solar o.27 ture (160.44 19 (84)m = (73 474 49 (heating seconds in the	6,62 3)m + 93.5 ason)	(83)m 481.94 area f	watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58		21	(84)
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter	66.8 111 Atternal and a 407.53 444 nal tempera during heat tor for gains	o.01 solar o.27 ture (160.44 19 (84)m = (73) 474 49 heating seareriods in the ving area, I	6,62 3)m + 93.5 ason)	(83)m 481.94 area f	watts 461.69	439 ble 9	1.6 127.94 .77 411.64	79.26	3 362.47		21	(84)
Total g (84)m= 7. Mea	34.15 ains – ir 376.72 an inter erature tion fac	66.8 111 Aternal and a 407.53 444 nal tempera during heat tor for gains Feb N	o.01 solar o.27 ture (ng po	160.44 19 (84)m = (73 474 49 (heating seareriods in the ving area, I	6.62 3)m + 93.5 ason) e living h1,m ((83)m 481.94 I area f	watts 461.69 from Tabble 9a)	439 ble 9	.77 411.64 , Th1 (°C)	79.26	3 362.47	362.21	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – in 376.72 an inter erature tion fac Jan 0.99	66.8 111 Aternal and a 407.53 444 nal tempera during heat tor for gains Feb N	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (73) 474 49 (heating seconds in the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, In the ving area, I	ason) e living h1,m ((83)m 481.94 1 area 1 see Ta Jun 0.5	from Table 9a) Jul 0.36	164 439 ole 9 A	.77 411.64 .Th1 (°C) ug Sep	79.26 379.8	3 362.47 Nov	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – in 376.72 an inter erature tion fac Jan 0.99	hternal and additional temperal during heat tor for gains Feb M 0.99 0.1 temperatur	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (73 474 49 (heating seconds in the ving area, I Apr N 0.88 0	ason) e living h1,m ((83)m 481.94 1 area 1 see Ta Jun 0.5	from Table 9a) Jul 0.36	164 439 ole 9 A	.77 411.64 .Th1 (°C) ug Sep 0.63 Table 9c)	79.26 379.8	3 362.47 t Nov 0.98	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 376.72 an interestature tion fact Jan 0.99 interna 20.47	66.8 110 Aternal and 407.53 440 Mal temperal during heat tor for gains Feb M 0.99 0.00 I temperatur 20.57 200	o.01 solar o.27 ture (ong pofor life) for life ge in 1.73	160.44 19 (84)m = (73 474 49 (heating seconds in the ving area, I Apr N 0.88 0 iving area 7 20.91 20	ason) e living h1,m (May .71 T1 (foll	(83)m 481.94 1 area 1 see Ta Jun 0.5 ow ste	watts 461.69 from Table 9a) Jul 0.36 ps 3 to 7	439 ole 9 A 0.3 7 in T	.77 411.64 .77 411.64 .Th1 (°C) ug Sep 0.63 .Table 9c)	79.26 379.8 Oct 0.91	3 362.47 t Nov 0.98	362.21 Dec 0.99	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 376.72 an interestature tion fact Jan 0.99 interna 20.47	hternal and a 407.53 444 hal temperal during heat tor for gains Feb M 0.99 0.1 temperatur 20.57 20 during heat	o.01 solar o.27 ture (ong pofor life) for life ge in 1.73	160.44 19 (84)m = (73 474 49 (heating searods in the ving area, I Apr	ason) e living h1,m (May .71 T1 (foll	(83)m 481.94 1 area 1 see Ta Jun 0.5 ow ste	watts 461.69 from Table 9a) Jul 0.36 ps 3 to 7	439 ole 9 A 0.3 7 in T	.77 411.64 .77 411.64 .78 Sep .89 0.63 .79 Sep .90 0.63 .70 Sep .70 0.63 .70 Sep .70 0.63	79.26 379.8 Oct 0.91	3 362.47 Nov 0.98	362.21 Dec 0.99	21	(84)
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(83)m= Total g (84)m= 7. Mean (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	an interrection factors of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the	1 temperatur 19.76 19	0.01	160.44 19 (84)m = (73 474 45 45 45 45 45 45 4	ason) e living h1,m (May .71 T1 (foll 0.98 st of d 0.34 ling, h2 .66 dwelling 0.33	(83)m 481.94 1 area f see Ta Jun 0.5 ow ste 21 welling 20.36 2,m (se 0.45 20.36 ng) = fl 20.66	watts 461.69 from Table 9a) Jul 0.36 ps 3 to 7 21 from Ta 20.36 ee Table 0.31 collow ste 20.36 A × T1 20.66	164 439 ble 9 0.3 7 in T 2 9a) 0.3 20. + (1 20.	.77 411.64 .77 411.64 .77 411.64 .78 Sep .99 0.63 .79 0.63 .79 0.63 .79 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .70 0.63 .7	79.26 379.8 Oct 0.91 20.9 20.34 0.88 9 9c) 20.23 A = Li	3 362.47 t Nov 0.98 20.66 4 20.34 0.98 3 19.91 ving area ÷ (Dec 0.99 20.45 20.33 0.99		(84) (85) (86) (87) (88) (89)

												1	
(93)m= 20.02	20.14	20.34	20.55	20.64	20.66	20.66	20.66	20.65	20.55	20.26	20		(93)
8. Space hea													
Set Ti to the the utilisation					ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		L						1					
(94)m= 0.99	0.98	0.95	0.86	0.68	0.47	0.33	0.36	0.6	0.89	0.98	0.99		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	•								
(95)m= 373.14	400.08	419.69	407.11	336.37	227.49	152.65	159.53	246.46	336.79	354.14	359.47		(95)
Monthly aver			i 		1				1			I	4
(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 602.1	an intern	1al tempe	343.17	ì	=[(39)m : 152.67	x [(93)m _{159.56}	``		509.64	646.70	1	(97)
(97)m= 623.38		Į		l	227.85		l	248.48	381.89		616.78		(97)
Space heatin (98)m= 186.18	135.75	92.87	30.34	5.06	0	0.02	0	0	33.55	111.96	191.44		
(66)11-	100.70	02.01	00.01	0.00				l per year	<u> </u>	<u> </u>		787.15	(98)
Space heatin	a roquir	omont in	k\\/h/m2	2/voor			. 0.10	por you.	(<i>)</i> • • • • • • • • • • • • • • • • • • •	715,512		(99)
·	• •											14.29	(99)
9b. Energy red			· ·	Ĭ									
This part is us Fraction of spa					_		.	•		unity scr	neme.	0	(301)
Fraction of spa								ĺ				1	(302)
					•		-// for	OUD and	45 65	- 41 4 4			(302)
The c <mark>ommu</mark> nity so inclu <mark>des boi</mark> lers, h					-				up to rour	otner neat	sources; ti	ne laπer	
Fraction of hea	at from (Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump				(3	02) x (303	a) =	1	(304a)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	g										l	kWh/yea	 r
Annual space	_	requiren	nent									787.15	\neg
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	826.51	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	ני												
Annual water		requirem	ent									1682.61	
If DHW from c													_
Water heat fro	m Comr	nunity he	eat pump)				(64) x (30	03a) x (30	5) x (306) :	=	1766.74	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	25.93	(313)
Cooling System	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	ed cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p							ء ادامه رو				1	22.5	(000-)
mechanical ve	nulation	- palanc	eu, extr	act or po	silivė inį	out from	outside					98.31	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	9b) + (330g) =	98.31	(331)
Energy for lighting (calculated in Appendix L)			270.05	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	2443.44	(338)
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 256	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	525.74	(367)
Electrical energy for heat distribution	[(313) x	0.52	13.46	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2) =	539.2	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		539.2	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	51.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	140.16	(379)
Energy saving/generation technologies (333) to (334) as application 1	able	0.52 x 0.01 =	-268.93	(380)
Total CO2, kg/year sum of (376)(382) =			461.45	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			8.37	(384)
El rating (section 14)			93.82	(385)

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	: Sampl	e 6 (Mid)			
Address :										
1. Overall dwelling dime	nsions:			(0)						•
Ground floor				a(m²) 55.1	(1a) x	Av. He	gight(m)	(2a) =	Volume(m) 165.3	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1)	55.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:										
Number of chimneys		secondar heating	y □ + □	other 0	7 ₌ [total 0	x	40 =	m³ per hou	ır ─── _{(6a}
Number of open flues	0 +	0	┧╻┝	0]		x	20 =	0	(6b
Number of intermittent far		0	J	0		0		10 =		╡`
	1S				Ļ	2			20	(7a)
Number of passive vents					Ĺ	0		10 =	0	(7b
Number of flueless gas fir	res					0	X ·	40 =	0	(7c
								Δir ch	nanges per h	our
Infiltration due to chimney	(c. fluor and fans – (6a)+(6b)+(7	′a)±(7h)±((7c) -	Г		_			_
If a pressurisation test has be					continue f	20 from (9) to		÷ (5) =	0.12	(8)
Number of storeys in th							-/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.					-	ruction			0	(11
if both types of wall are pr deducting areas of openin		sponding to	the grea	ter wall are	a (after					
If suspended wooden f		aled) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught s	stripped							0	(14
Window infiltration				0.25 - [0.2	,	-			0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value,	•		•	•	•	netre of e	envelope	area	5	(17
If based on air permeabili Air permeability value applies	-					ris heina u	beau		0.37	(18
Number of sides sheltere		as been dor	ie or a de	gree an pe	тнеаршу	is being u	360		3	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.78	(20
Infiltration rate incorporati	ing shelter factor			(21) = (18) x (20) =				0.29	(21
Infiltration rate modified for	or monthly wind spee	ed								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Mind Factor (00.) (25)\								-	
Wind Factor (22a)m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m =	′ 	0.05	0.05	0.00	4	1 4 00	1 4 40	1 4 40	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

Adjusted infiltra	0.36	e (allowi	0.32	0.31	0.27	0.27	0.27	(22a)m 0.29	0.31	0.32	0.34	1	
Calculate effec		l	1				0.27	0.29	0.51	0.52	0.54	J	
If mechanica	al ventila	ition:										0	
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	
a) If balance						ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		
b) If balance		i					/IV) (24b	<u> </u>	2b)m + (23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		
c) If whole h				•					F (00l-	. \			
if (22b)n 24c)m= 0	1 < 0.5 ×	(23b), t	nen (240	(230)	o); otnerv	wise (24)	C) = (220)	0) m + 0.	5 × (230	0	0	1	
									U		J 0	J	
d) If natural if (22b)n				•	•				0.5]				
24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56]	
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		
2. Heat lease	and be	at loss											
3. Heat losse	s and ne				Net Ar	00	U-valu	10	AXU		k-value		ΑΧk
LEMENT	area		Openin m		A,r		W/m2		(W/I	K)	k-value kJ/m²-l		kJ/K
)oo <mark>rs</mark>					2.4	x	1	= [2.4				
Vin <mark>dows</mark> Type	1				4.16	x1,	/[1/(1.4)+	0.04] =	5.52	Ħ			
Vindows Type	2				4.8	x1,	/[1/(1.4)+	0.04] =	6.36	Ħ			
Valls Type1	24		8.96		15.04	X	0.18	=	2.71	F r		¬	
Valls Type2	24		2.4		21.6	x	0.18	<u> </u>	3.89	F i		F F	
Valls Type3	2.4		0		2.4	×	0.18	=	0.43	≓ i		=	
otal area of e					50.4								
for windows and			effective wi	ndow U-va			formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	
* include the area	as on both	sides of in	nternal wal	ls and par	titions								
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				21.3	31
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	546.	56
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	0
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge				ısina Ar	nendix k	<						2.5	2
details of therma	`	,		٠.	•	`						2.5	
otal fabric he		a. o	o (00)	0,00,0	•/			(33) +	(36) =			23.8	33
entilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 30.94	30.8	30.66	30	29.88	29.31	29.31	29.2	29.53	29.88	30.13	30.39		
leat transfer o	coefficier	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•	
39)m= 54.77	54.62	54.48	53.83	53.71	53.14	53.14	53.03	53.36	53.71	53.95	54.21]	
		<u> </u>				L	L		L	L	<u>. </u>	├	

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
0.99	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.97	0.97	0.98	0.98		
umber of day	e in mor	oth (Tabl	a 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.98	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
-													
1. Water heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		84		(42
nnual averag educe the annua ot more that 125	e hot wa Il average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.91		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		—
nergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		934.88	(44
5)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
									Total = Su	m(45) ₁₁₂ =		1225.78	(45
inst <mark>antane</mark> ous w													
6)m= 19.06 ater storage	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
/ater storage) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day).				1	39		(4
emperature fa) 10 Kilo	**** (1.000)	"day).					54		(4
nergy lost fro				ear			(48) x (49)) =			75		(50
) If manufact	urer's de	eclared o	ylinder l	oss fact									•
ot water stora	•			e 2 (kW	h/litre/da	ıy)					0		(5
community h	_		JII 4.3								0		(5:
emperature fa			2b							-	0		(5:
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
inter (50) or (-	,							-	75		(5
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
cylinder contains	dedicated	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi:	хH	
7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
rimary circuit	loss (an	nual) fro	m Table	3							0		(58
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fr	om Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
` —										_			

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		(61)
Total he	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		(62)
Solar DH	W 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 ad	ditional	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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	134.18	150.42	158.43	169.67		_
								Οι	utput from wa	ater heate	r (annual)₁	12	1774.4	(64)
Heat ga	ains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	79.53	70.63	75.41	69.32	69.18	63.6	62.79	66.55	65.7	71.8	73.76	78.2		(65)
includ	de (57)r	n in calc	culation o	of (65)m	only if o	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a):									
Metabo	lic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>ting</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	14.88	13.21	10.74	8.13	6.08	5.13	5.55	7.21	9.68	12.29	14.34	15.29		(67)
Applian	i <mark>ce</mark> s gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	16 0.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooking	g gains	(calcula	ited in A	pendix	L, equat	ion L15	or L15a)	, also	see Table	5				
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61		(71)
Water h	neating	gains (T	able 5)											
(72)m=	106.9	105.1	101.36	96.28	92.98	88.34	84.39	89.45	91.25	96.5	102.44	105.11		(72)
Total in	nternal	gains =	1			(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	'1)m + (72)	m		
(73)m=	335.82	334.02	323.62	307	290.37	274.19	263.57	268.63	3 277.09	293.89	313.16	327.36		(73)
6. Sola	ar gains	:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		ccess Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
West	_							-					` '	7,000
West	0.9x	0.77	X	4.1		-	9.64	X	0.63		0.7	=	24.97	(80)
West	0.9x	0.77	x	4.8			9.64	X	0.63		0.7	=	28.81	(80)
West	0.9x	0.77	X	4.1		-	88.42	X	0.63	x	0.7	=	48.85	(80)
44G91	0.9x	0.77	Х	4.8	В	x 3	88.42	X	0.63	x	0.7	=	56.36	(80)

West	0.9x	0.77	X	4.16	X	6	3.27	x	0.63	X	0.7	=	80.44	(80)
West	0.9x	0.77	x	4.8	X	6	3.27	x	0.63	x	0.7	=	92.82	(80)
West	0.9x	0.77	x	4.16	X	9	92.28	x	0.63	x	0.7	=	117.32	(80)
West	0.9x	0.77	x	4.8	X	9	92.28	x	0.63	x	0.7		135.37	(80)
West	0.9x	0.77	x	4.16	X	1	13.09	x	0.63	x	0.7		143.78	(80)
West	0.9x	0.77	x	4.8	X	1	13.09	x	0.63	x	0.7	=	165.9	(80)
West	0.9x	0.77	x	4.16	X	1	15.77	x	0.63	x	0.7	=	147.18	(80)
West	0.9x	0.77	x	4.8	X	1	15.77	х	0.63	x	0.7		169.83	(80)
West	0.9x	0.77	x	4.16	X	1	10.22	x	0.63	x	0.7	=	140.13	(80)
West	0.9x	0.77	x	4.8	X	1	10.22	x	0.63	x	0.7	=	161.68	(80)
West	0.9x	0.77	x	4.16	X	9	94.68	x	0.63	x	0.7	=	120.37	(80)
West	0.9x	0.77	x	4.8	X	9	94.68	x	0.63	x	0.7		138.88	(80)
West	0.9x	0.77	x	4.16	X	7	73.59	х	0.63	x	0.7		93.56	(80)
West	0.9x	0.77	x	4.8	X	7	73.59	х	0.63	x	0.7		107.95	(80)
West	0.9x	0.77	x	4.16	x	4	15.59	x	0.63	×	0.7		57.96	(80)
West	0.9x	0.77	x	4.8	x	4	15.59	x	0.63	x	0.7		66.88	(80)
West	0.9x	0.77	x	4.16	X	2	24.49	х	0.63	x	0.7		31.13	(80)
West	0.9x	0.77	x	4.8	X	2	24.49	Х	0.63	X	0.7	=	35.92	(80)
West	0.9x	0.77	x	4.16	x	1	6.15	x	0.63	x	0.7		20.53	(80)
West	0.9x	0.77	x	4.8	x	1	6.15		0.63	x	0.7		23.69	(80)
								7						
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m														
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 53.78 105.21 173.26 252.69 309.68 317.01 301.81 259.25 201.51 124.84 67.06 44.23 (83)														
Solar g (83)m=	ains in 53.78					317.01	301.81	`	<u> </u>	(82)m 124.8	4 67.06	44.23		(83)
(83)m =	53.78	105.21 17	3.26		.68		301.81 , watts	`	<u> </u>		4 67.06	44.23		(83)
(83)m =	53.78	105.21 173	3.26	252.69 309	.68)m +			`	.25 201.51			44.23 371.59		(83) (84)
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Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.98 0.96 0.89 0.73 0.53 0.37 0.41 0.68 0.93 0.98 0.99 Useful gains, hmGm, W = (94)m x (84)m (95)m= 386.7 432.64 477.65 496.15 439.3 310.88 208.45 218.27 325.84 387.47 374.24 369.41 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm, W = (39)m x (93)m - (96)m] (97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98)s
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm: (94)m= 0.99
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Useful gains, hmGm , W = (94)m x (84)m (95)m= 386.7 432.64 477.65 496.15 439.3 310.88 208.45 218.27 325.84 387.47 374.24 369.41 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98) _{159.12} = 1530.08 (98) Space heating requirement in kWh/m²/year
(95)m= 386.7 432.64 477.65 496.15 439.3 310.88 208.45 218.27 325.84 387.47 374.24 369.41 (95)m= 386.7 432.64 477.65 496.15 439.3 310.88 208.45 218.27 325.84 387.47 374.24 369.41 (95)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)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)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 (97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 (97)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.96 23.12 (98)m= 328.97 249.36 188.25 82.9
(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)m Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 (97)m = 828.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 0 0 0 0 0 0 96.19 222.76 338.48 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m = 328.97 249.36 188.25 82.96 23.12 (98)m =
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(97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 (97)m= 828.86 803.71 730.67 611.38 470.37 314.73 208.86 219.05 341.26 516.76 683.63 824.36 (97)m — (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1530.08 (98) Space heating requirement in kWh/m²/year 27.77 (99)
(98)m= 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1530.08 (98) Space heating requirement in kWh/m²/year 27.77 (99)
Total per year (kWh/year) = Sum(98) _{15,912} = 1530.08 (98) Space heating requirement in kWh/m²/year (27.77 (99)
Space heating requirement in kWh/m²/year 27.77 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (20
Fraction of space heat from main system(s) (202) = 1 - (201) =
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1
Efficiency of secondary/supplementary heating system, %
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above) 328.97 249.36 188.25 82.96 23.12 0 0 0 0 96.19 222.76 338.48
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (213)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (214)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (215)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (216)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (217)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (218)m = \{[(98)m \times $
Total (kWh/year) = Sum(211) ₁₅₁₀₁₂ = 1636.45 (21
Space heating fuel (secondary), kWh/month $= \{[(98)m \times (201)] \} \times 100 \div (208)$
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0
Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)
Water heating
Output from water heater (calculated above)
173.68 153.24 161.29 145.09 142.54 127.89 123.32 134.64 134.18 150.42 158.43 169.67
Efficiency of water heater 79.8 (21)
(217)m= 86.49 86.11 85.23 83.39 81.14 79.8 79.8 79.8 79.8 83.66 85.72 86.62 (21)
Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m
(219)m= 200.81 177.96 189.25 173.99 175.68 160.26 154.53 168.72 168.15 179.81 184.82 195.88 Total = Sum(219a), 12 = 2129.86 (219)m= 200.81 177.96 189.25 173.99 175.68 160.26 154.53 168.72 168.15 179.81 184.82 195.88 (219)m= 200.81 177.96 189.25 173.99 175.68 160.26 154.53 168.72 168.15 179.81 184.82 195.88
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 1636.45
1000.40

					,
Water heating fuel used				2129.86	_
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				262.71	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4104.02	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	353.47	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	460.05	(264)
Space and water heating	(261) + (262) + (263) + (264) =			813.52	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	136.34	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		988.79	(272)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Flat Dwelling type:

Detachment:

2022 Year Completed:

Floor Location: Floor area:

> Storey height: 66.25 m² 3 m

Floor 0

27.2 m² (fraction 0.411) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	F <mark>rame</mark> :
DOOR	Manufactur	er Solid			Wood
Balcon	y Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	
N	Manufactur	er Windows	low-E, En = 0.05	s, soft coat No	
E	Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
Balcony		0.7	0.4	1	4.8	1
N		0.7	0.4	1	5.44	1
F		0.7	0.4	1	1 44	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
Balcony		N	North	0	0
N		N	North	0	0
E		Е	East	0	0

Overshading: Heavy

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elem	<u>nents</u>						
N	10.24	10.24	0	0.15	0	False	N/A
E	1.44	1.44	0	0.15	0	False	N/A
INT	13.2	2.4	10.8	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Floor	66.25			0.11			N/A

Internal Elements Party Elements

SAP Input

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma	FSAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty	Address	: Sample	e 1 (Bott	om)			
Address :	•										
1. Overall dwelling dime	ensions:			A ===	a (res 2 \		Av. Ha	: a.b.4/\		Value a/m²	21
Ground floor					a(m²) 66.25	(1a) x		ight(m)	(2a) =	Volume(m ²	(3a)
Total floor area TFA = (1	a)+(1b)+(1c	:)+(1d)+(1e	e)+(1ı	ገ)	6.25	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	198.75	(5)
2. Ventilation rate:											
Number of chimneys	main heatir		econdar neating	ry +	other 0	7 = [total 0	x 4	40 =	m³ per hou	ı r (6a)
Number of open flues		 	0	╡ᆠ╞	0	_	0	x	20 =	0	(6b)
Number of intermittent fa						J		x	10 =		(7a)
						Ļ	0		10 =	0	╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flues an	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has t			ed, procee	ed to (17),	otherwise (continue fr	rom (9) to ((16)			
Number of storeys in t Additional infiltration	he dw <mark>elling</mark>	(ns)						[(0)	11,0 1	0	(9)
Structural infiltration: 0	25 for stee	l or timber	frame o	. 0.35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	dollori			0	(\\
deducting areas of openi	• /			4 / 1							_
If suspended wooden		,	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en Percentage of window			trinned							0	(13)
Window infiltration	3 and doors	draugitt 3	пррси		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expres	ssed in cut	oic metre	es per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabi	lity value, th	en (18) = [(1	7) ÷ 20]+(8), otherw	ise (18) =	(16)				0.15	(18)
Air permeability value applie		sation test ha	s been doi	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelters Shelter factor	ed				(20) – 1 -	[0.075 x (1	19)1 –			2	(19)
Infiltration rate incorpora	ting shelter	factor			(20) = 1 (21) = (18)	`	10)] =			0.85	= (20)
Infiltration rate modified	•		4		(-1) - (10	, ^ (20) -				0.13	(21)
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp			1 5011	1 001	1 ,,,,,,	ı Oop	1 000	1 1101	1 200	J	
(22)m= 5.1 5	4.9 4.4	i	3.8	3.8	3.7	4	4.3	4.5	4.7]	
			1	1		1	1	1	1	ı	
Wind Factor (22a)m = (2						1	1	<u> </u>	<u> </u>	1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m			_	-	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calcul ate effec If mechanica		-	rate for t	пе арріі	саріе са	se						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23)
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mech	anical ve	entilation	with he	at recov	erv (MVI	HR) (24a	a)m = (22	2b)m + (23b) x [1 – (23c)		(
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24t)m = (22	2b)m + (2	 23b)	!	l	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole he				•	•				5 × (23b))	•	1	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural v				•	•				n 51			l	
24d)m= 0	0	0	0	0	0	0	0.5 1 [(2	0	0.0]	0	0]	(24
Effective air	 change	rate - er	ter (24a	L) or (24b	o) or (24	c) or (24	d) in box	(25)	ļ	ļ		l	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
													_
3. Heat losses	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
Doors	S.1. 5 S.	(Ü		2.4	x	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				4.8	X	1/[1/(1)+	0.04] =	4.62	Ħ			(27
Vindows Type					5.44		1/[1/(1)+		5.23	Ħ			(27
Vindows Type					1.44	-	1/[1/(1)+	0.04] =	1.38	4			(27
loor					66.25	 	0.11		7.2875	=			(28
Valls Type1	10.2) _A	10.2	4	0	x	0.15	-	0	=		= =	(29
Valls Type2	1.44		1.44	=	0	^	0.15	-	0	ᆿ ¦		╡	(29
Valls Type3	13.2		2.4		10.8	_	0.15	- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - </td <td>1.62</td> <td>᠆</td> <td></td> <td>+ +</td> <td>(29</td>	1.62	᠆		+ +	(29
Valls Type4	2.4		0			i x	0.13	=	0.84	믁 ¦		╡	(29
otal area of el					2.4	=	0.35	= [0.64				
for windows and * include the area	roof windo	ows, use e					ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	ı 3.2	(3*
abric heat los							(26)(30)) + (32) =				24.34	(33
leat capacity (•	,					((28)	(30) + (32	2) + (32a).	(32e) =	5153.5	ऱ
hermal mass	•		P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assess an be used instea	ments wh	ere the de	tails of the	,			ecisely the	e indicative	values of	TMP in Ta	able 1f		`
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						14.03	(30
	l bridging	are not kn	own (36) =	= 0.05 x (3	31)								
details of therma otal fabric hea	at loss							(33) +	(36) =			38.36	(37
		alculated	d monthly	У					$(36) =$ $= 0.33 \times ($	25)m x (5))	38.36	(3

											T		(00)
` '	7.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7		(38)
Heat transfer coe			54.40	5400	50.40	50.40	50.07	· · · ·	= (37) + (3	_	T 55.00		
(39)m= 55.9 5	5.69	55.48	54.43	54.22	53.18	53.18	52.97	53.6	54.22	54.64	55.06	54.38	(39)
Heat loss parame	eter (H	ILP), W/	m²K						= (39)m ÷	Sum(39)₁ (4)	12 / 12=	34.30	(00)
(40)m= 0.84 0).84	0.84	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83		_
Number of days in	n mor	nth (Tabl	le 1a)					/	Average =	Sum(40) ₁	12 /12=	0.82	(40)
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•										•		
4. Water heating	g ener	gy requi	rement:								kWh/ye	ear:	
Assumed occupa	ncv N	J									45		(42)
if TFA > 13.9, N if TFA £ 13.9, N	N = 1 -		[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (ΓFA -13.		.15		(42)
Annual average h		ter usag	ge in litre	s per da	ıy Vd,av	erage =	(25 x N)	+ 36		8	5.3		(43)
Reduce the annual av	•		0,		•	Ū	to achieve	a water us	e target o	f			
	, ,		,				A	0	0-1	Nlavi			
Jan Hot water usage in liti	Feb res per	Mar day for ea	Apr ach month	Vd,m = fa	Jun	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	0.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
(11)= 00.00 0	0.12	07.01	00.0	00.10	70.77	10.71	30.10			m(44) ₁₁₂ =		1023.65	(44)
Ener <mark>gy cont</mark> ent of hot	water i	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		 `
(45)m= 139.15 12	21.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		_
If instantaneous water	r heatin	na at noint	of use (no	hot water	storage)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1342.17	(45)
	8.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage los		10.04	10.42	13.70	13.0	12.0	14.40	14.03	17.03	10.01	20.21		(40)
Storage volume (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community hear	•			•			` '						
Otherwise if no st Water storage los		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufacture		clared l	oss facto	or is kno	wn (kWh	n/dav):					0		(48)
Temperature fact					`	3,					0		(49)
Energy lost from	water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(50)
b) If manufacture			-										
Hot water storage				e 2 (kWl	n/litre/da	ıy)				0.	.02		(51)
If community hear Volume factor from	-		JII 4.3							1	.03		(52)
Temperature fact			2b							-	0.6		(53)
Energy lost from	water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or (54)		-	•								.03		(55)
Water storage los	ss cald	culated f	or each	month			((56)m = (55) × (41)r	n				
(56)m= 32.01 2	8.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains de	dicated	solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 32.01 2	8.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fron	n Table 3					0		(58)
Primary circuit loss calculated fo		59)m = (58) ÷ 36	65 × (41)m					
(modified by factor from Table	,	, , ,	` '	der thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23.26	23.26 22.5	23.26	22.51	23.26		(59)
Combi loss calculated for each r	month (61)m =	(60) ÷ 365 × (41)m					
(61)m= 0 0 0	0 0	0 0	0 0	0	0	0		(61)
Total heat required for water hea	ating calculated	for each month	(62)m = 0.85	× (45)m +	(46)m +	(57)m +	(59)m + (61)m	
	162.99 160.34	144.15 139.29	151.68 151.	- ì	177.59	190.04	(00)	(62)
Solar DHW input calculated using Apper	ndix G or Appendix	H (negative quantit	(enter '0' if no	solar contribut	ion to wate	r heating)		
(add additional lines if FGHRS a						3,		
(63)m= 0 0	0 0	0 0	0 0	0	0	0		(63)
FHRS 17.95 15.96 16.41	14.51 13.96	12.12 11.22	12.87 13.0)2 15.02	16.24	17.46		(63) (G2
Output from water heater								
(64)m= 173.8 153.25 161.77	145.88 143.69	129.44 125.38	136.13 135.	43 151.27	158.76	169.9		
	'	· · · · · · · · · · · · · · · · · · ·	Output fror	n water heate	r (annual) ₁	12	1784.71	(64)
Heat gains from water heating, k	دWh/month 0.2	5 ´ [0.85 × (45)m	ı + (61)m] + 0	.8 x [(46)m	+ (57)m	+ (59)m]	
(65)m= 90.49 80.41 85.98	79.2 79.15	72.94 72.15	76.27 75.2	23 82.02	84.06	89.03		(65)
include (57)m in calculation of	f (65)m only if c	ylinder is in the	dwelling or ho	t wate <mark>r is f</mark> i	rom com	munity h	eating	
5. Internal gains (see Table 5 a	and 5a):							
Metabolic gains (Table 5), Watts	3							
Jan Feb Mar	Apr May	Jun Jul	Aug Se	ep Oct	Nov	Dec		
(66)m= 107.59 107.59 107.59	107.59 107.59	107.59 107.59	107.59 107.	59 107.59	107.59	107.59		(66)
Lighting gains (calculated in App	pendix L, equati	ion L9 or L9a), a	lso see Table	5				
(67)m= 17.65 15.68 12.75	9.65 7.22	6.09 6.58	8.56 11.4	14.58	17.02	18.14		(67)
Appliances gains (calculated in /	Appendix L, eq	uation L13 or L1	3a), also see	Table 5	!			
(68)m= 188.39 190.35 185.42	174.93 161.69	149.25 140.94	138.98 143.	91 154.4	167.64	180.08		(68)
Cooking gains (calculated in App	pendix L, equat	ion L15 or L15a), also see Ta	ble 5				
(69)m= 33.76 33.76 33.76	33.76 33.76	33.76 33.76	33.76 33.7	76 33.76	33.76	33.76		(69)
Pumps and fans gains (Table 5a	a)	•	!					
(70)m= 0 0 0	0 0	0 0	0 0	0	0	0		(70)
Losses e.g. evaporation (negative	ve values) (Tab	le 5)	!!	<u>'</u>	!			
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07 -86.0	07 -86.07	-86.07	-86.07		(71)
Water heating gains (Table 5)	'	•	!	!				
(72)m= 121.63 119.66 115.56	110 106.39	101.3 96.98	102.52 104.	49 110.25	116.75	119.66		(72)
Total internal gains =	,	(66)m + (67)n	n + (68)m + (69)n	n + (70)m + (7	'1)m + (72)	m		
	349.86 330.58	311.92 299.78	305.34 315.	16 334.5	356.68	373.16		(73)
6. Solar gains:								
Solar gains are calculated using solar f	flux from Table 6a	and associated equa	ations to convert t	to the applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux	_ g_		FF		Gains	
Table 6d	m²	Table 6a	Table	6b T	able 6c		(W)	_
North 0.9x 0.77 x	4.8	x 10.63	X 0.4	×	0.7	=	9.9	(74)

	_												
North	0.9x	0.77	X	5.44	X	10.63	X	0.4	X	0.7	=	11.22	(74)
North	0.9x	0.77	X	4.8	X	20.32	X	0.4	Х	0.7	=	18.93	(74)
North	0.9x	0.77	X	5.44	X	20.32	X	0.4	X	0.7	=	21.45	(74)
North	0.9x	0.77	X	4.8	X	34.53	X	0.4	X	0.7	=	32.16	(74)
North	0.9x	0.77	X	5.44	X	34.53	X	0.4	x [0.7	=	36.45	(74)
North	0.9x	0.77	X	4.8	X	55.46	X	0.4	x	0.7	=	51.66	(74)
North	0.9x	0.77	X	5.44	X	55.46	X	0.4	x	0.7	=	58.55	(74)
North	0.9x	0.77	X	4.8	X	74.72	X	0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	X	5.44	X	74.72	X	0.4	x	0.7	=	78.87	(74)
North	0.9x	0.77	X	4.8	X	79.99	X	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	5.44	X	79.99	X	0.4	x [0.7	=	84.43	(74)
North	0.9x	0.77	X	4.8	X	74.68	X	0.4	x	0.7	=	69.55	(74)
North	0.9x	0.77	X	5.44	x	74.68	X	0.4	x [0.7	=	78.83	(74)
North	0.9x	0.77	X	4.8	x	59.25	X	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	X	5.44	X	59.25	X	0.4	x	0.7	=	62.54	(74)
North	0.9x	0.77	X	4.8	X	41.52	X	0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	X	5.44	X	41.52	X	0.4	x	0.7	=	43.82	(74)
North	0.9x	0.77	X	4.8	X	24.19	X	0.4	Х	0.7	=	22.53	(74)
North	0.9x	0.77	×	5.44	x	24.19	x	0.4	х	0.7	_	25.53	(74)
North	0.9x	0.77	X	4.8	х	13.12		0.4	х	0.7	=	12.22	(74)
North	0.9x	0.77	x	5.44	X	13.12	X	0.4	х	0.7	=	13.85	(74)
North	0.9x	0.77	X	4.8	x	8.86	Х	0.4	х	0.7	=	8.26	(74)
North	0.9x	0.77	x	5.44	X	8.86	X	0.4	х	0.7	=	9.36	(74)
East	0.9x	0.77	×	1.44	х	19.64	X	0.4	х	0.7	=	5.49	(76)
East	0.9x	0.77	x	1.44	x	38.42	X	0.4	x	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.44	X	63.27	X	0.4	x	0.7	=	17.68	(76)
East	0.9x	0.77	x	1.44	X	92.28	X	0.4	x	0.7	=	25.78	(76)
East	0.9x	0.77	X	1.44	X	113.09	X	0.4	x	0.7	=	31.6	(76)
East	0.9x	0.77	X	1.44	X	115.77	X	0.4	x	0.7	=	32.35	(76)
East	0.9x	0.77	X	1.44	X	110.22	x	0.4	x	0.7	=	30.8	(76)
East	0.9x	0.77	X	1.44	X	94.68	X	0.4	x	0.7	=	26.45	(76)
East	0.9x	0.77	X	1.44	X	73.59	X	0.4	x	0.7	=	20.56	(76)
East	0.9x	0.77	X	1.44	X	45.59	X	0.4	x	0.7	=	12.74	(76)
East	0.9x	0.77	x	1.44	x	24.49	x	0.4	x	0.7		6.84	(76)
East	0.9x	0.77	x	1.44	x	16.15	x	0.4	x	0.7	=	4.51	(76)
							_						
Solar g	ains in	watts, calc	ulated	for each m	onth		(83)n	n = Sum(74)m	(82)m		,	•	
(83)m=	26.62		86.29			91.28 179.1		.17 103.05	60.8	32.91	22.13		(83)
Ī			- 1	<u> </u>		(83)m , watts			1			1	4
(84)m=	409.56	432.07	455.3	485.85 51	0.63	503.2 478.9	6 449	.51 418.21	395.3	389.59	395.29		(84)
7. Me	an interi	nal tempei	rature	(heating se	ason)								
Temp	erature	during hea	ating p	eriods in th	e living	area from T	Table 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gair	ns for I	iving area,	h1,m (s	see Table 9a	a)					 1	
	Jan	Feb	Mar	Apr	May	Jun Jul	A	ug Sep	Oct	Nov	Dec		
04	-0.4 -0.04		0 = = 4 (CAD 0 02) h	. ,,	_						_	5 of 7

(86)m= 1	1	0.99	0.96	0.86	0.66	0.49	0.54	0.81	0.97	0.99	1		(86)
Mean interna	ıl temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m= 20.21	20.3	20.47	20.71	20.9	20.99	21	21	20.95	20.73	20.44	20.2		(87)
Temperature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ıble 9, Ti	n2 (°C)					
(88)m= 20.22	20.22	20.22	20.23	20.24	20.25	20.25	20.25	20.25	20.24	20.23	20.23		(88)
Utilisation fac	ctor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)		-	-	-		
(89)m= 1	0.99	0.99	0.95	0.82	0.59	0.4	0.45	0.75	0.96	0.99	1		(89)
Mean interna	ıl temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)			•	
(90)m= 19.16	19.29	19.53	19.89	20.14	20.24	20.25	20.25	20.21	19.92	19.5	19.15		(90)
	!				•			f	LA = Livin	g area ÷ (4) =	0.41	(91)
Mean interna	ıl temper	ature (fo	r the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) x T2					
(92)m= 19.59	19.7	19.92	20.23	20.46	20.55	20.56	20.56	20.51	20.25	19.89	19.58		(92)
Apply adjustr	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	re appro	priate	ļ.			
(93)m= 19.59	19.7	19.92	20.23	20.46	20.55	20.56	20.56	20.51	20.25	19.89	19.58		(93)
8. Space hea	ating requ	uirement											
Set Ti to the					ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	-			iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m= 1	0.99	0.98	0.95	0.84	0.62	0.44	0.49	0.77	0.96	0.99	1		(94)
Us <mark>eful g</mark> ains,	hmGm	, W = (9	4)m x (8	4)m	<u> </u>								
(95)m= 407.75	428.97	447.98	460.55	426.73	311.12	210.01	219.38	322.79	378.38	385.92	393.87		(95)
Monthly aver		rnal tem									1		
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	T .	1		1	1	T		· ,	ī	000.07	040.00	Ī	(07)
(97)m= 854.66	824.31	744.35	616.55	474.78	316.34	210.46	220.27	343.8	523.3	698.67	846.93		(97)
Space heatin	265.66	220.5	112.32	35.75	0	0.02	0	0	107.82	225.18	337.08		
(11)									(kWh/year	<u> </u>		1636.82	(98)
Space heatin	a requir	ament in	k\/\/h/mi	2/vear				7 - 7	(),	, (-	7	24.71	(99)
·	• .											24.71	(00)
9b. Energy red This part is us							ing prov	idad by	o oomm	unity ook	nomo		
Fraction of spa			• .		_		.	•		urilly Sci	ienie.	0	(301)
Fraction of spa	ace heat	from co	- mmunity	svstem	1 – (30°	1) =						1	(302)
The community so			•	•	,	,	allows for	CHD and I	un to four	other heat	sources: t		(002)
includes boilers, h									ир то тоит	ouror ricat	3001003, 1	no lattor	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comr	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	(2c) for (commun	itv heatii	na syste	m					1.05	(306)
		(,		.,au	3 2,010	-						
Space heating Annual space	_	reguiren	nent									kWh/ye 1636.82	aı
		10011										1000.02	

				_
Space heat from Community heat pump	(98) x (304a) x (305	s) x (306) =	1718.66	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appendix	E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 100 ÷	(308) =	0	(309)
Water heating Annual water heating requirement			1784.71]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305	s) x (306) =	1873.94	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) +	(310a)(310e)] =	35.93	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from or	utside		118.21	(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) =	118.21	(331)
Energy for lighting (calculated in Appendix L)			311.73	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total Juli and June (2007) - (200) - (240) - (240)				= - -
Total delivered energy for all uses (307) + (309) + (310) + (312) +	(315) + (331) + (332)	.(237b) =	3504.36	(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP)	Energy Er	mission factor g CO2/kWh	Emissions kg CO2/year	(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	Energy Er kWh/year kg	mission factor g CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(37b)]	Energy Er kWh/year kg wo fuels repeat (363) to (366	mission factor g CO2/kWh c) for the second fuel	Emissions kg CO2/year](367a)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)	Energy Er kWh/year kg wo fuels repeat (363) to (366 10b)] x 100 ÷ (367b) x	mission factor g CO2/kWh) for the second fue 0.52 =	Emissions kg CO2/year 256 728.34 18.65](367a)](367)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution [(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+	Energy	mission factor g CO2/kWh o) for the second fuel 0.52 = 0.52 =	256 728.34 18.65 746.99	(367a) (367) (372)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution [(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+	Energy kWh/year kg wo fuels repeat (363) to (366 10b)] x 100 ÷ (367b) x 313) x 63)(366) + (368)(372) 09) x	mission factor g CO2/kWh for the second fuel 0.52	256 728.34 18.65 746.99	(367a) (367) (372) (373)
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CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution [(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+	Energy kWh/year kg wo fuels repeat (363) to (366 10b)] x 100 ÷ (367b) x 313) x 63)(366) + (368)(372) 09) x us heater (312) x 73) + (374) + (375) = g (331)) x sle	mission factor g CO2/kWh o) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.	256 728.34 18.65 746.99 0 746.99 61.35 161.79	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO3 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applicabilitem 1	Energy kWh/year kg wo fuels repeat (363) to (366 10b)] x 100 ÷ (367b) x 313) x 63)(366) + (368)(372) 09) x us heater (312) x 73) + (374) + (375) = g (331)) x sle	mission factor g CO2/kWh o) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.	256 728.34 18.65 746.99 0 746.99 61.35 161.79	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380)

				User D	etails:						
Assessor Name:					Strom	a Num	ber:				
Software Name:	Stroma FS	SAP 201	2		Softwa	are Ve	rsion:		Versio	n: 1.0.5.51	
			Р	roperty.	Address	Sample	e 1 (Bott	om)			
Address :											
Overall dwelling dime	ensions:			۸ro	a(m²)		Λν Hο	ight(m)		Volume(m ³	31
Ground floor					<u> </u>	(1a) x	AV. HE	3	(2a) =	198.75	(3a
Total floor area TFA = (1	a)+(1h)+(1c)+	.(1d)_(1o	.\⊥ (1r			(4)]` ′		`
	α) ((15) ((15) ((14)1(16	,, , , , , , , , , , , , , , , , , , , ,	')	0.23)+(3c)+(3c	4)+(30)+	(3n) -		7,5
Dwelling volume						(3a)+(3b)+(30)+(30	ı)+(3e)+	.(311) =	198.75	(5)
2. Ventilation rate:	main	94	econdai	·v	other		total			m³ per hou	ır
NI salas afallas a	heating	<u>_h</u>	eating	-		, ,			40	-	
Number of chimneys	0	╛╵	0	<u></u>	0	<u> </u>	0		40 =	0	(6a
Number of open flues	0	+	0	_] +	0] = <u>[</u>	0	x :	20 =	0	(6b
Number of intermittent fa	ns						2	X	10 =	20	(7a
Number of passive vents							0	X ·	10 =	0	(7b
Number of flueless gas fi	res						0	X 4	40 =	0	(7c
						_			A I		
						_		<u> </u>		nanges per ho	our —
Infiltration due to chimne						antinus fi	20		÷ (5) =	0.1	(8)
If a pressurisation test has b Number of storeys in the			ea, procee	a 10 (17), (otnerwise (onunue ir	OIII (9) 10 ((10)		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0	.25 for steel o	r timber t	frame or	0.35 fo	r masoni	y consti	ruction			0	(11
if both types of wall are padeducting areas of openia			ponding to	the great	er wall are	a (after					
If suspended wooden f	• /		ed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en	ter 0.05, else	enter 0								0	(13
Percentage of windows	s and doors d	raught st	ripped							0	(14
Window infiltration					0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate							12) + (13) -			0	(16
Air permeability value,					•	•	etre of e	envelope	area	5	(17
If based on air permeabil Air permeability value applie	-						is heina u	sad		0.35	(18
Number of sides sheltere		on tool nac	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	io oi a aog	groo an po	modbinty	io boilig at	50 u		2	(19
Shelter factor					(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20
Infiltration rate incorporat	ing shelter fa	ctor			(21) = (18	x (20) =				0.3	(21
Infiltration rate modified f	or monthly wi	nd speed	l						•		
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7								1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4										
	1.23	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

Adjusted infiltr	ation rate	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		•		i	
0.38 Calculate effe	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
If mechanica		•	iale ioi l	пе аррп	cable ca	3E						0	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	лV) (24b	m = (22)	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					.5 × (23b))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n									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		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	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. Heat losse	s and he	eat loss r	naramet	jr.					_				
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value)	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>					2.4	Х	1	=	2.4				(26
Vindows Type	1				4.8	x1.	/[1/(1.4)+	0.04] =	6.36				(27
Vindows Type	2				5.44	x1.	/[1/(1.4)+	0.04] =	7.21				(27
Vindows Type	3				1.44	х1	/[1/(1.4)+	0.04] =	1.91				(27
loor					66.25	5 X	0.13	=	8.61249	9			(28
Valls Type1	10.2	4	10.2	4	0	X	0.18	=	0	\Box [(29
Valls Type2	1.44	4	1.44		0	Х	0.18	=	0				(29
Valls Type3	13.2	2	2.4		10.8	Х	0.18	=	1.94				(29
Valls Type4	2.4		0		2.4	х	0.18	=	0.43	$\overline{}$		$\neg \ $	(29
otal area of e	lements	, m²			93.53	3						_	(3
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions		(26) (20	\					——
abric heat los		•	U)				(26)(30	, , ,	(20) : (20	2) . (22-)	(20-)	28.87	=
leat capacity	,	•	. Cm	T[. l. l/m2l/				(30) + (32	, , ,	(32e) =	5153.5	
hermal mass for design assess	•	`		,			ecisely the		tive Value		ahla 1f	250	(3
an be used inste				JOHSHUCL	ion ale 110	. AHOWH PI	ooiseiy uit	, maicanyt	, vaiu c s Ul	rivii III I (abic II		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						4.68	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)								
otal fabric he									(36) =			33.55	5 (3
entilation hea			·						= 0.33 × () 	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

											1		ı	
(38)m=	37.53	37.35	37.16	36.32	36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38)
Heat to	ansfer o	oefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	71.08	70.89	70.71	69.87	69.71	68.97	68.97	68.84	69.26	69.71	70.03	70.37		_
Heat lo	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} · (4)	12 /12=	69.87	(39)
(40)m=	1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.04	1.05	1.05	1.06	1.06		_
Niconala				la 4a\					,	Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Numbe		Feb	nth (Tab		Mov	lup	Jul	Λιια	Sep	Oct	Nov	Dec		
(41)m=	Jan 31	28	Mar 31	Apr 30	May 31	Jun 30	31	Aug 31	30	31	30	31		(41)
(41)111–		20				30			30	J1] 30	J 31		(,
4 10/												1.20/1./		
4. VV	ater heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
	ned occu											.15		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.	.9)			
		•	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		8!	5.3		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	welling is	designed t	to achieve		se target o		0.0		(- /
not mor	e that 125	litres per	person per	r day (all w		not and co	la)						ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat		n litres pei	day for ea	ach month			able 1c x	(43)						
(44)m=	93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		¬
Energy	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1023.65	(44)
(45)m=	139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
							1 0:			Γotal = Su	m(45) ₁₁₂ =	=	1342.17	(45)
If instan	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)		1	1	ı	
(46)m=	20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
	storage		includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
_		, ,	ind no ta	•			•		A1110 VOO	001		150		(47)
		-			-			mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:									•			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	.39		(48)
Tempe	erature f	actor fro	m Table	2b							0.	.54		(49)
			storage	-				(48) x (49)) =		0.	.75		(50)
,			eclared of factor fr	-								0		(51)
		•	ee secti		C 2 (KVV	11/11110/00	·y <i>)</i>					0		(31)
	e factor	_										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	55)								0.	.75		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylind	er contains	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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) fro	m Table 3				0	1	(58)
Primary circuit loss calculated for		59)m = (58) ÷ 3	65 × (41)m			•	
(modified by factor from Table	e H5 if there is s	solar water heat	ing and a cylinde	er thermostat)		_	
(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 calculated for each	month (61)m =	(60) ÷ 365 × (41	I)m				
(61)m= 0 0 0	0 0	0 0	0 0	0 0	0	1	(61)
Total heat required for water he	eating calculated	for each month	n (62)m = 0.85 ×	(45)m + (46)m ·	+ (57)m +	(59)m + (61)m	
(62)m= 185.75 163.79 172.18	154.58 151.65	135.75 130.6	143 142.64	160.28 169.19	181.36]	(62)
Solar DHW input calculated using Appe	endix G or Appendix	H (negative quanti	ty) (enter '0' if no sola	ar contribution to wa	ter heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, see Ap	opendix G)			_	
(63)m= 0 0 0	0 0	0 0	0 0	0 0	0		(63)
FHRS 0 0 0	0 0	0 0	0 0	0 0	0	-	(63) (G2
Output from water heater							
(64)m= 185.75 163.79 172.18	154.58 151.65	135.75 130.6	143 142.64	160.28 169.19	181.36		_
			Output from w	ater heater (annual)112	1890.79	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (45)r	n + (61)m] + 0.8	x [(46)m + (57)r	n + (59)m	1]	
(65)m= 83.54 74.14 79.03	72.48 72.21	66.22 65.21	69.33 68.51	75.08 77.34	82.08		(65)
include (57)m in calculation of	of (65)m only if c	ylinder is in the	dwelling or hot w	vate <mark>r is from co</mark> r	nmunity h	neating	
5. Internal gains (see Table 5	and 5a):						
Metabolic gains (Table 5), Watt	S						
Jan Feb Mar	Apr May	Jun <mark>Jul</mark>	Aug Sep	Oct Nov	Dec		
(66)m= 107.59 107.59 107.59	107.59 107.59	107.59	107.59 107.59	107.59 107.59	107.59		(66)
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or L9a), a	also see T <mark>able 5</mark>				
(67)m= 17.21 15.29 12.43	9.41 7.04	5.94 6.42	8.34 11.2	14.22 16.59	17.69]	(67)
Appliances gains (calculated in	Appendix L, eq	uation L13 or L	13a), also see Ta	able 5		-	
(68)m= 188.39 190.35 185.42	174.93 161.69	149.25 140.94	138.98 143.91	154.4 167.64	180.08		(68)
Cooking gains (calculated in Ap	pendix L, equat	tion L15 or L15a	a), also see Table	e 5		•	
(69)m= 33.76 33.76 33.76	33.76 33.76	33.76 33.76	33.76 33.76	33.76 33.76	33.76		(69)
Pumps and fans gains (Table 5	a)	-	-	-		•	
(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)
Losses e.g. evaporation (negati	ive values) (Tab	ole 5)	•	•	-	•	
(71)m= -86.07 -86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07 -86.07	-86.07		(71)
Water heating gains (Table 5)	•	•	•	•	_	•	
(72)m= 112.29 110.32 106.23	100.67 97.05	91.97 87.65	93.18 95.15	100.91 107.41	110.33		(72)
Total internal gains =	•	(66)m + (67)ı	m + (68)m + (69)m +	(70)m + (71)m + (7	2)m	•	
(73)m= 376.17 374.23 362.36	343.29 324.06	305.44 293.28	298.79 308.54	327.8 349.92	366.38]	(73)
6. Solar gains:					•		
Solar gains are calculated using solar	flux from Table 6a	and associated equ	ations to convert to tl	he applicable orient	ation.		
Orientation: Access Factor	Area	Flux	g_ Toble 6b	FF Table 60		Gains	
Table 6d	m²	Table 6a	Table 6b	Table 6c	; 	(W)	-
North 0.9x 0.77 x	4.8	x 10.63	x 0.63	X 0.7	=	15.6	(74)

North	0.9x	0.77		Κ [5.44	X	10	0.63	X	0.63	X	0.7	=	17.68	(74)
North	0.9x	0.77	;	κ [4.8	X	20	0.32	X	0.63	X	0.7	=	29.81	(74)
North	0.9x	0.77		κ [5.44	X	20	0.32	X	0.63	X	0.7	=	33.78	(74)
North	0.9x	0.77		κ [4.8	x	34	1.53	x	0.63	x	0.7	=	50.65	(74)
North	0.9x	0.77		(5.44	x	34	1.53	x	0.63	х	0.7	=	57.41	(74)
North	0.9x	0.77		(4.8	x	55	5.46	x	0.63	x	0.7	=	81.36	(74)
North	0.9x	0.77		· [5.44	x	5	5.46	x	0.63	X	0.7	=	92.21	(74)
North	0.9x	0.77		· [4.8	x	74	1.72	x	0.63	X	0.7	=	109.6	(74)
North	0.9x	0.77		κ [5.44	X	74	1.72	X	0.63	X	0.7	=	124.22	(74)
North	0.9x	0.77		· [4.8	x	79	9.99	X	0.63	X	0.7	=	117.33	(74)
North	0.9x	0.77		· [5.44	x	79	9.99	x	0.63	X	0.7	=	132.98	(74)
North	0.9x	0.77		· [4.8	x	74	1.68	x	0.63	X	0.7	=	109.55	(74)
North	0.9x	0.77		κ [5.44	x	74	1.68	x	0.63	x	0.7	=	124.15	(74)
North	0.9x	0.77		κ [4.8	x	59	9.25	x	0.63	x	0.7	=	86.91	(74)
North	0.9x	0.77		ĸ [5.44	x	59	9.25	x	0.63	x	0.7	=	98.5	(74)
North	0.9x	0.77		κ [4.8	x	4	1.52	x	0.63	x	0.7	=	60.9	(74)
North	0.9x	0.77	,	ΚĪ	5.44	x	4	1.52	x	0.63	x	0.7	=	69.02	(74)
North	0.9x	0.77	;	(4.8	X	24	1.19	Х	0.63	X	0.7	=	35.48	(74)
North	0.9x	0.77		ΚĪ	5.44	x	24	1.19	x	0.63	x	0.7		40.22	(74)
North	0.9x	0.77		κ [4.8	х	1;	3.12	x	0.63	x	0.7	=	19.24	(74)
North	0.9x	0.77		([5.44	x	1;	3.12	x	0.63	x	0.7	=	21.81	(74)
North	0.9x	0.77	,	ΚĪ	4.8	x	8	.86	Х	0.63	x	0.7	=	13	(74)
North	0.9x	0.77	7 ;	ΚĪ	5.44	×	8	.86	X	0.63	x	0.7		14.74	(74)
East	0.9x	0.77		ĸ [1.44	х	19	9.64	X	0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77	,	、 [1.44	x	38	3.42	x	0.63	x	0.7		16.91	(76)
East	0.9x	0.77	;	κ [1.44	x	63	3.27	x	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77		ĸ [1.44	x	92	2.28	x	0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77		٠ [1.44	x	11	3.09	x	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77		٠ [1.44	x	11	5.77	x	0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77		٠ [1.44	x	11	0.22	x	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	,	ΚĪ	1.44	x	94	1.68	x	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	,	κĪ	1.44	x	7:	3.59	x	0.63	x	0.7	=	32.39	(76)
East	0.9x	0.77	,	٠ [1.44	x	4	5.59	x	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	;	ΚĪ	1.44	x	24	1.49	x	0.63	x	0.7		10.78	(76)
East	0.9x	0.77	;	Κ	1.44	x	10	6.15	x	0.63	x	0.7	<u> </u>	7.11	(76)
				-		-									_
Solar g	ains in y	watts, ca	lculate	d 1	for each mon	th_			(83)m	= Sum(74)m .	(82)m			-	
(83)m=	41.92	80.5	135.91		214.19 283.59		01.26	282.2	227	.08 162.31	95.76	51.83	34.85		(83)
Total ga				_	(84)m = (73) n	<u> </u>								7	
(84)m=	418.09	454.73	498.27		557.47 607.69	5 6	506.7	575.48	525	.86 470.85	423.5	7 401.75	401.22		(84)
7. Mea	an interi	nal tempe	erature	e (I	neating seaso	n)									
Tempe	erature	during he	eating	ре	riods in the li	ving	area f	rom Tal	ole 9,	Th1 (°C)				21	(85)
Utilisa <u></u>	tion fac	tor for ga	ins fo	· liv	ving area, h1,	m (s	ee Tal	ole 9a)							
	Jan	Feb	Mar		Apr May	/	Jun	Jul	A	ug Sep	Oct	Nov	Dec]	
0	0 4 D 004	0.1/	40554	رم	AD 0.02\ http://									D	E of 7

Mean internal temperature in the rest of dwelling) = fLA x T1 + (1 - fLA) x T2 x = 1 \															
19.88 20.01 20.23 20.55 20.83 20.96 20.99 20.89 20.85 20.17 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.67 19.6	(86)m=	1	1	0.99	0.96	0.87	0.69	0.52	0.59	0.85	0.98	0.99	1		(86)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C)	Mear	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Comp	(87)m=	19.89	20.01	20.23	20.55	20.83	20.96	20.99	20.99	20.89	20.55	20.17	19.87		(87)
Utilisation factor for gains for rest of dwelling, h2/m (see Table 9a) (89)m=	Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89) (89	(88)m=	20.02	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.03		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)					•	
Solid 18.55 18.72 19.05 19.51 19.87 20.03 20.05 20.05 19.95 19.51 18.97 18.53 (9)	(89)m=	1	0.99	0.99	0.95	0.82	0.6	0.41	0.47	0.78	0.96	0.99	1		(89)
Solid 18.55 18.72 19.05 19.51 19.87 20.03 20.05 20.05 19.95 19.51 18.97 18.53 (9)	Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)			•	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m							- ` `	r	i 			18.97	18.53		(90)
(92)me							!	!	!	f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
(92)me	Mear	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) x T2			'		
33 35 35 35 35 35 35 35			· ·	· `	i	i	· · · · ·	i	<u> </u>		19.94	19.46	19.08		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.64 0.46 0.52 0.81 0.96 0.99 1 Useful gains, hmGm, W = (94)m x (84)m (95)m= 416.22 451,26 498.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 Monthly average external tem perature from Table 8 (96)m= 4.3 4.9 6.5 9.9 11.7 44.6 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 - (95)m] x (41)m (98)m= 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWhyear) = Sum(98)s. = 2415.73 (98) Space heating requirement for Wh/m²/year 36.46 (99) 39. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Quality of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Quality of total heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {(198)m x (204)} x 100 ÷ (206) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52	Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate				
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	(93)m=	19.1	19.25	19.53	19.94	20.26	20.41	20.44	20.43	20.34	19.94	19.46	19.08		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Sp	ace hea	ting requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.64 0.46 0.52 0.81 0.96 0.99 1 Useful gains, hmcm, W = (94)m x (84)m (95)m= 416.22 451.26 499.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = (39)m x [(93)m - (96)m] (97)m= 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98)42 = 2415.73 (98) Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year 93. Energy requirements — Individual heating systems including micro-CHP) Space heating from main system 1 (204) = (202) x [1 - (203)] = 1 (202) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system 1 (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system (204) = (202) x [1 - (203)] = 4 (204) Efficiency of secondary/supplementary heating system, % Quantification of total heating from main system (204) 3 (208) Efficiency of secondary/supplementary heating system, % Quantification of total heating from the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the proper	tne u			Ţ			lun	lul	Aug	Con	Oct	Nov	Doo		
(94) (94) (94) (94) (94) (95) (94) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (9	l Itilie:		-			IVIAY	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
Useful gains, hmGm. W = (94)m x (84)m (95)m = 416.22 451.26 489.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m - (96)m] (97)m = (1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = (472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Space heating requirement in kWh/m²/year 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06 504.06			_			0.84	0.64	0.46	0.52	0.81	0.96	0.99	1		(94)
(95)me 416.22 451.26 489.5 526.74 508.08 385.54 262.46 273.52 379.46 408.05 398.26 399.77 Monthly average external temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14/6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)me 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98)s = 2415.73 (98) Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of total heating from main system 1 (202) x [1 - (203)] = 1 (202) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 0 180.77 336.52 481.52 (211) m = {[(98)m x (204)]} x 100 ÷ (206) (211)		ıl gains,	hmGm	, W = (9		4)m									
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Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 2415.73 (98)	Mont	hly aver	age exte	rnal tem	perature	from T	able 8							I	
(97)m= 1051.94 1017.23 921.65 771.19 596.93 400.82 264.54 277.6 432 651.01 865.64 1046.97 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98)ssv = 2415.73 (98) Space heating requirement in kWh/m²/year Total per year (kWh/year) = Sum(98)ssv = 2415.73 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	(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)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 Total per year (kWh/year) = Sum(98) _{1.48-12} = 2415.73 (98) Space heating requirement in kWh/m²/year 36.46 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
Space heating requirement in kWh/m²/year Sac.46 (99)	` '		<u> </u>										1046.97		(97)
Space heating requirement in kWh/m²/year Sum(98) _{1.49-12} = 2415.73 (98)				1			i	1	 	i ` i	- `			I	
Space heating requirement in kWh/m²/year 36.46 (99)	(98)m=	472.98	380.33	321.52	176	66.1	0	0					l		(oo)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201)									Tota	ıl per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2415.73	=
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 180.77 336.52 481.52 (211) m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211) (211) (211)	Spac	e heatin	g require	ement in	kWh/m²	²/year								36.46	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211) m = {[(98)m x (204)] } x 100 ÷ (206) (201) 0 (202) 1 (202) 1 (204) 204) 205 807 808 809 809 809 800 800 800	9a. En	ergy red	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211) m = {[(98) m x (204)] } x 100 ÷ (206) 505.86 406.77 343.87 188.24 70.7 0 0 0 0 193.34 359.91 514.99	•		_			, ,									
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 505.86 406.77 343.87 188.24 70.7 0 0 0 0 193.34 359.91 514.99		-					mentary	-		(004)				0	
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 505.86 406.77 343.87 188.24 70.7 0 0 0 0 193.34 359.91 514.99 (208)					•	. ,				, ,				1	
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year				•	•				(204) = (2	02) x [1 – ((203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 472.98 380.33 321.52 176 66.1 0 0 0 180.77 336.52 481.52 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 505.86 406.77 343.87 188.24 70.7 0 0 0 193.34 359.91 514.99	Effici	ency of ı	main spa	ace heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above)	Effici	ency of	seconda	ry/suppl	ementar	y heatin	g system	າ, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	/ear
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ 505.86 $	Spac			- `		d above)							1	
505.86 406.77 343.87 188.24 70.7 0 0 0 193.34 359.91 514.99		472.98	380.33	321.52	176	66.1	0	0	0	0	180.77	336.52	481.52		
	(211)n	n = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)								•	(211)
Total (kWh/year) =Sum(211) _{15,1012} = 2583.67 (211)		505.86	406.77	343.87	188.24	70.7	0	0		_					
									Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2583.67	(211)

Space heating fuel (secondary), kWh/month									
$= \{[(98)m \times (201)]\} \times 100 \div (208)$									
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		
		-	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	_	0	(215)
Water heating									
Output from water heater (calculated above) 185.75 163.79 172.18 154.58 151.65 163.79 172.18 154.58 151.65 163.79 172.18 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154.58 154	135.75	130.6	143	142.64	160.28	169.19	181.36		
Efficiency of water heater	135.75	130.6	143	142.04	100.20	169.19	101.30	70.0	(216)
(217)m= 87.2 86.99 86.46 85.16 82.77	79.8	79.8	79.8	79.8	85.14	86.61	87.3	79.8	(217)
Fuel for water heating, kWh/month	70.0	7 0.0	70.0	70.0	00.14	00.01	07.0		(=,
(219) m = (64) m x $100 \div (217)$ m								ı	
(219)m= 213.01 188.29 199.16 181.52 183.22	170.11	163.66	179.19	178.75	188.27	195.34	207.75		_
			Tota	I = Sum(2				2248.27	(219)
Annual totals Space heating fuel used, main system 1					k\	Wh/year	•	kWh/year	7
								2583.67	╣
Water heating fuel used								2248.27	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(2 30g) =			75	(231)
Electricity for lighting								303.98	(232)
Total delivered energy for all uses (211)(221) +	- (231) -	+ (232).	(237b)	=				5210.92	(338)
12a. CO2 emissions – Individual heating system	ns inclu	ding mid	cro-CHP		_				
		ergy			Emiss	ion fac	tor	Emissions	
	kWl	h/year			kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(211)) x			0.2	16	=	558.07	(261)
Space heating (secondary)	(215)) x			0.5	19	=	0	(263)
Water heating	(219)) x			0.2	16	=	485.63	(264)
Space and water heating	(261)) + (262) -	+ (263) + (264) =				1043.7	(265)
Electricity for pumps, fans and electric keep-hot	(231)) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232)) x			0.5	19	=	157.76	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1240.39	(272)
							ı		_

TER =

(273)

18.72

SAP Input

Property Details: Sample 2 (Bottom)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

Unknown

No related party

Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height:

Floor 0 66.25 m^2 3 m

Living area: 27.2 m² (fraction 0.411)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	F <mark>rame</mark> :
DOO	R	<u>Manuf</u> actur <mark>e</mark> r	Solid			W <mark>ood</mark>
W		Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
N		Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
Balco	ony	Manufactur <mark>e</mark> r	Windows	low-E, En = 0.05, soft coat	No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
N		0.7	0.4	1	10.24	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
N		N	North	0	0
Balcony		N	North	0	0

Overshading: More than average

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elem	<u>nents</u>						
N	31.8	15.04	16.76	0.15	0	False	N/A
W	18.75	1.44	17.31	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	66.25			0.11			N/A

Internal Elements
Party Elements

SAP Input

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			P	roperty.	Address	: Sample	e 2 (Bott	om)			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (2\		Av. Ha	: a.b.4/\		Value a/m²	21
Ground floor					a(m²) 66.25	(1a) x		ight(m)	(2a) =	Volume(m ²	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)	+(1d)+(1e	e)+(1ı	ገ) 6	6.25	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	198.75	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdar neating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ı r (6a)
Number of open flues		╡ + ト	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa		L		J L		_			10 =		(7a)
						Ļ	0		10 =	0	╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	ys, flues and	I fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has t			ed, procee	d to (17), (otherwise (continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	he dw <mark>elling</mark> (ns)						[(0)	11,0 1	0	(9)
Structural infiltration: 0	25 for steel	or timber	frame o	. 0. 35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	dottori			0	(''')
deducting areas of openi											_
If suspended wooden		•	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en Percentage of window			tripped							0	(13)
Window infiltration	3 and doors	draught 3	пррец		0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(14)
Infiltration rate					(8) + (10)	+ (11) + (1	- 12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expres	sed in cub	oic metre	s per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabi				•	•	•		·		0.15	(18)
Air permeability value applie	es if a pressuris	ation test ha	s been doi	ne or a deg	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed				(20) 4	[0 07F /4	10)1			2	(19)
Shelter factor					` '	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	•		J		(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified			1	11	۸~	800	Oct	Mov	Doo]	
Jan Feb	Mar Apr		Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
(22/11-	7.4	1 7.5	L 3.5	L 5.5	L 3.7	<u> </u>	I 7.5	L 7.5	L'	J	
Wind Factor (22a)m = $(2$	2)m ÷ 4									_	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				-	
0.16 Calculate effec	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
If mechanica		•	ale ioi i	пе аррп	cable ca	3 C						0.5	(23
If exhaust air he	at pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat recov	very: effic	iency in %	allowing t	for in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mecha	nical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1	1 – (23c)	÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24
b) If balance	d mecha	nical ve	ntilation	without	heat red	covery (N	MV) (24b	m = (22)	2b)m + (2	23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole he if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural v				•	•				0.5]		•	-	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change r	ate - er	iter (24a) or (24l	o) or (24	c) or (24	d) in bo	x (25)	-	-	-	-	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and hea	at loss r	paramet	er:							_	_	
ELEMENT	Gross	s	Openin		Net Ar		U-val		AXU		k-value		ΑXk
	are <mark>a (</mark>	(m²)	m	12	1, A	m²	W/m2	2K	(W/I	<)	kJ/m²-	K	kJ/K
Doors –					2.4	X	1.4	=	3.36				(26
Vindows Type					1.44		1/[1/(1)+		1.38	닡			(27
Vin <mark>dows Type</mark>					10.24		1/[1/(1)+		9.85	닉			(27
Vindows Type 	3				4.8	_	1/[1/(1)+	0.04] =	4.62	ᆗ ,			(27
loor –					66.2	=	0.11	=	7.2875	닠		┩	(28
Valls Type1	31.8		15.0	4	16.76	S X	0.15	= !	2.51	닠 !		⊣	(29
Valls Type2	18.75	5	1.44	<u> </u>	17.3	1 ×	0.15	=	2.6	_		╛╘	(29
Valls Type3	11.1		2.4	_	8.7	X	0.15	=	1.3	_		╛╘	(29
Valls Type4	2.4		0		2.4	X	0.35	=	0.84				(29
otal area of el	•				130.3								(3
for windows and * include the area						lated using	g formula 1	!/[(1/U-valu	ıe)+0.04] a	is given in	paragrapl	h 3.2	
abric heat los							(26)(30)) + (32) =				33.75	(3:
Heat capacity Cm = S(A x k)							((28)(30) + (32) + (32a)(32e) =						3 (34
hermal mass	paramet	er (TMF	P = Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(3:
or design assess an be used instea				construct	ion are no	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	es : S (L :	x Y) cal	culated	using Ap	pendix	K						19.55	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)				(0.0)				
Otal tabria bac	at loss							(33) +	(36) =			53.29	(3
otal fabric hea entilation hea		الماداد		_					= 0.33 × (OE) (E)		33.29	(•

(00) 47.50	17.00	17.44	40.07	45.00	44.04	44.04	44.04	45.00	45.00	40.00	107		(20)
(38)m= 17.53	17.32	17.11	16.07	15.86	14.81	14.81	14.61	15.23	15.86	16.28	16.7		(38)
Heat transfer (39)m= 70.82	70.61	nt, W/K 70.41	69.36	69.15	68.11	68.11	67.9	(39)m 68.52	69.15	38)m 69.57	69.99		
(39)111= 170.62	70.01	70.41	09.30	09.13	00.11	00.11	07.9		Average =		l	69.31	(39)
Heat loss para	meter (l	HLP), W	m²K						= (39)m ÷		12 / 12-		(==)
(40)m= 1.07	1.07	1.06	1.05	1.04	1.03	1.03	1.02	1.03	1.04	1.05	1.06		_
Number of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occu	inanav	NI											(40)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		.15		(42)
Annual averag	je hot wa										5.3		(43)
Reduce the annua							to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								Эер	Oct	1404	Dec		
(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19	83.6	87.01	90.42	93.83		
									Γotal = Su	· '	L	1023.65	(44)
Energy content of		used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
If instantaneous w	vater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)		Γotal = Su	m(45) ₁₁₂ =	= [1342.17	(45)
(46)m= 20.87	18.26	18.84	16.42	15.76	13.6	12.6	14.46	14.63	17.05	18.61	20.21		(46)
Water storage		!	l		l	l .	l						
Storage volum	` '		•			•		ame ves	sel		0		(47)
If community h Otherwise if no	_			•			' '	ers) ente	ar '∩' in <i>(</i>	<i>4</i> 7)			
Water storage		not wate) (till) ii	ioidaes i	iistaiitai	10003 00	TIDI DON	craj crito	,, 0 111 (- 11)			
a) If manufact	urer's d	eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)) =		1	10		(50)
b) If manufactHot water store			-							0	.02		(51)
If community h	•			0 2 (1.77)	11/11(10)(40	· y /				0.	.02		(01)
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or	. , .	•	, ,	.1			((==) (1.	.03		(55)
Water storage					i .		((56)m = (i			
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	v Ll	(56)
If cylinder contains		r	1		ı	1				1		Λ 1 Π	/ >
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 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 0 0 0 0 0
(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 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)m= 0 0 0 0 0 0 0 0 0 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 0
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(62)m= 194.43 171.63 180.87 162.99 160.34 144.15 139.29 151.68 151.05 168.96 177.59 190.04 (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)
(62)m= 194.43 171.63 180.87 162.99 160.34 144.15 139.29 151.68 151.05 168.96 177.59 190.04 (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)
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)
FHRS 17.95 15.96 16.41 14.51 13.96 12.12 11.22 12.87 13.02 15.02 16.24 17.46 (63) (G2
Output from water heater
(64)m= 173.8 153.25 161.77 145.88 143.69 129.44 125.38 136.13 135.43 151.27 158.76 169.9
Output from water heater (annual) ₁₁₂ 1784.71 (64)
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 x [(46)m + (57)m + (59)m]
(65)m= 90.49 80.41 85.98 79.2 79.15 72.94 72.15 76.27 75.23 82.02 84.06 89.03 (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
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 107.59 107.59 107.59 107.59 107.59 107.59 107.59 107.59 107.59 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
(67)m= 16.81 14.93 12.14 9.19 6.87 5.8 6.27 8.15 10.93 13.88 16.2 17.27 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 188.39 190.35 185.42 174.93 161.69 149.25 140.94 138.98 143.91 154.4 167.64 180.08 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m= 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 33.76 (69)
Pumps and fans gains (Table 5a)
(70)m =
Losses e.g. evaporation (negative values) (Table 5)
(71)m= -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 -86.07 (71)
Water heating gains (Table 5)
(72)m= 121.63 119.66 115.56 110 106.39 101.3 96.98 102.52 104.49 110.25 116.75 119.66 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
(73)m= 382.1 380.21 368.4 349.4 330.23 311.63 299.46 304.93 314.61 333.8 355.86 372.29 (73)
6. Solar gains:
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)
North 0.9x 0.77 x 10.24 x 10.63 x 0.4 x 0.7 = 21.13 (74)

North	0.9x	0.77	X	4.8	X	10	0.63	X	0.4	X	0.7	=	9.9	(74)
North	0.9x	0.77	×	10.24	x	20	0.32	x	0.4	x	0.7	=	40.38	(74)
North	0.9x	0.77	x	4.8	x	20	0.32	x	0.4	x	0.7	=	18.93	(74)
North	0.9x	0.77	X	10.24	x	34	4.53	x	0.4	x	0.7	=	68.61	(74)
North	0.9x	0.77	X	4.8	x	34	4.53	x	0.4	х	0.7	=	32.16	(74)
North	0.9x	0.77	X	10.24	x	5	5.46	x	0.4	х	0.7	=	110.21	(74)
North	0.9x	0.77	X	4.8	x	5	5.46	x	0.4	x	0.7	=	51.66	(74)
North	0.9x	0.77	X	10.24	x	7-	1.72	x	0.4	х	0.7	=	148.46	(74)
North	0.9x	0.77	X	4.8	x	7-	1.72	x	0.4	х	0.7	=	69.59	(74)
North	0.9x	0.77	X	10.24	x	79	9.99	x	0.4	x	0.7	=	158.93	(74)
North	0.9x	0.77	X	4.8	x	79	9.99	x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	X	10.24	x	7-	4.68	x	0.4	х	0.7	=	148.38	(74)
North	0.9x	0.77	X	4.8	x	7-	4.68	x	0.4	x	0.7		69.55	(74)
North	0.9x	0.77	×	10.24	x	5	9.25	x	0.4	x	0.7	=	117.72	(74)
North	0.9x	0.77	x	4.8	x	5:	9.25	x	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	x	10.24	x	4	1.52	х	0.4	x	0.7	=	82.49	(74)
North	0.9x	0.77	X	4.8	x	4	1.52	х	0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	X	10.24	X	24	4.19	Х	0.4	Х	0.7	=	48.06	(74)
North	0.9x	0.77	= x	4.8	j x	24	4.19	х	0.4	x	0.7	= -	22.53	(74)
North	0.9x	0.77	×	10.24	х	1:	3.12	×	0.4	х	0.7	=	26.06	(74)
North	0.9x	0.77	j x	4.8	x	1:	3.12	x	0.4	х	0.7	=	12.22	(74)
North	0.9x	0.77	j ×	10.24	x	8	.86	Х	0.4	x	0.7	=	17.61	(74)
North	0.9x	0.77	X	4.8	j x	8	.86	Х	0.4	х	0.7	=	8.26	(74)
West	0.9x	0.77	i x	1.44	x	1	9.64	x	0.4	х	0.7	=	5.49	(80)
West	0.9x	0.77	i x	1.44	X	3	3.42	x	0.4	_ ×	0.7		10.74	(80)
West	0.9x	0.77	×	1.44	x	6:	3.27	x	0.4	x	0.7	=	17.68	(80)
West	0.9x	0.77	X	1.44	x	9:	2.28	х	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	X	1.44	j×	11	3.09	x	0.4	×	0.7	=	31.6	(80)
West	0.9x	0.77	X	1.44	x	11	5.77	х	0.4	x	0.7	=	32.35	(80)
West	0.9x	0.77	X	1.44	X	11	0.22	x	0.4	x	0.7	=	30.8	(80)
West	0.9x	0.77	X	1.44	j x	94	4.68	x	0.4	×	0.7	=	26.45	(80)
West	0.9x	0.77	×	1.44	x	7:	3.59	x	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	×	1.44	x	4:	5.59	x	0.4	x	0.7		12.74	(80)
West	0.9x	0.77	×	1.44	x	24	1.49	x	0.4	x	0.7	-	6.84	(80)
West	0.9x	0.77	×	1.44	x	10	6.15	x	0.4	×	0.7	=	4.51	(80)
	_				_									
Solar g	ains in v	watts, calcu	lated	for each mon	ıth			(83)m	ı = Sum(74)m	(82)m				
(83)m=	36.52	70.04 11	8.45	187.65 249.6	5 2	65.77	248.73	199	.36 141.72	83.33	45.12	30.38		(83)
Total ga	ains — ir	nternal and	solar	(84)m = (73) r	n + (83)m ,	watts						•	
(84)m=	418.62	450.25 48	6.85	537.05 579.8	8 5	77.41	548.19	504	.28 456.33	417.14	400.99	402.68		(84)
7. Mea	an interr	nal tempera	iture (heating seas	on)									
Tempe	erature	during heat	ing pe	eriods in the I	iving	area f	rom Tal	ble 9,	Th1 (°C)				21	(85)
Utilisa	tion fact	tor for gains	s for li	ving area, h1	<u>,m (</u> s	ee Tal	ole 9a)							_
	Jan	Feb I	Mar	Apr Ma	у	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
Stroma F	SAP 2011	2 Version: 1.0	5 51 (9	SAP 9 92) - http:/	/\ <u>\</u> \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	etroma	com —						Page	5 of 7

				_									
(86)m= 1	1	0.99	0.97	0.88	0.71	0.54	0.6	0.86	0.98	0.99	1		(86)
Mean internal	temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m= 19.9	20.01	20.22	20.54	20.81	20.96	20.99	20.99	20.88	20.55	20.18	19.88		(87)
Temperature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m= 20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04		(88)
Utilisation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)	-	-	-	-		
(89)m= 1	0.99	0.99	0.95	0.84	0.62	0.43	0.49	0.79	0.97	0.99	1		(89)
Mean internal	temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)			•	
(90)m= 18.56	18.72	19.03	19.49	19.86	20.03	20.06	20.06	19.96	19.52	18.98	18.54		(90)
<u> </u>		•			•	!	!	f	LA = Livin	g area ÷ (4) =	0.41	(91)
Mean internal	temper	ature (fo	r the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) x T2			'		
(92)m= 19.11	19.25	19.52	19.92	20.25	20.41	20.44	20.44	20.34	19.94	19.47	19.09		(92)
Apply adjustm	nent to t	he mean	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	ļ.	!		
(93)m= 19.11	19.25	19.52	19.92	20.25	20.41	20.44	20.44	20.34	19.94	19.47	19.09		(93)
8. Space heat	ting requ	uirement											
Set Ti to the r					ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	$\overline{}$			Iviay	Juli	Jui	Aug	Seb	Oct	INOV	Dec		
(94)m= 1	0.99	0.98	0.95	0.85	0.66	0.47	0.54	0.82	0.97	0.99	1		(94)
Useful gains,	hmGm	, W = (94	4)m x (8	4)m	<u> </u>								
(95)m= 416.74	446.95	479.02	510.77	494.47	378.91	259.27	269.81	372.68	402.55	397.52	401.2		(95)
Monthly avera		rnal tem									1		
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate				r	1	-`` / 	- ` 	<u> </u>	ī	000.75	4040.00	[(07)
(97)m= 1048.81			764.42	591.28	395.99	261.62	274.24	427.48	645.97	860.75	1042.39		(97)
Space heating (98)m= 470.26	380.56	325.77	182.63	72.03	0	0.02	0	0	181.11	333.52	477.05		
` /				<u> </u>	<u> </u>		ITota	l per year	l (kWh/year	r) = Sum(9	8) _{15.912} =	2422.93	(98)
Space heating	a requir	ement in	k\/\/h/m²	2/vear					` •	,		36.57	(99)
	• •			•	achama							30.37	(00)
9b. Energy req This part is use							ting prov	ided by	a comm	unity sol	nomo		
Fraction of spa			• .		•		• .	•		urnity Sci	icilic.	0	(301)
Fraction of spa	ce heat	from co	mmunity	v svstem	1 – (30	1) =						1	(302)
The community sc			•	•	,	,	allows for	CHP and i	un to four i	other heat	sources: ti		`` ′
includes boilers, h									ap to rour v	011101 11001	000,000, 1	TO TOLLOT	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	l (Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribution los	s factor	(Table 1	(2c) for (commun	ity heati	ng svste	m	-				1.05	(306)
Space heating		,	-,		,Ja.	J -, 5.5						kWh/ye	
Annual space I	-	requiren	nent									2422.93	
	· · · · · · · · · · · · · · · · · ·	. 1	-										

Space heat from Community heat pump	(98) x (304a) x (305) x (30	06) =	2544.07	(307a)
Efficiency of secondary/supplementary heating system in %	(from Table 4a or Appendix E)		0] (308
Space heating requirement from secondary/supplementary	system (98) x (301) x 100 ÷ (308)	= [0	(309)
Water heating		L		J
Annual water heating requirement			1784.71]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (30	ne) -	1873.94	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a	Ĺ	44.18](313)
Cooling System Energy Efficiency Ratio	0.01 × [(0014)(0010) + (0104	,(8188)] = [0](314)
Space cooling (if there is a fixed cooling system, if not enter	$(0) = (107) \div (314) =$	L T	0](315)
Electricity for pumps and fans within dwelling (Table 4f):	(151) ((51))	L		
mechanical ventilation - balanced, extract or positive input fr	om outside		118.21	(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	=	118.21	(331)
Energy for lighting (calculated in Appendix L)		[296.83	(332)
Electricity generated by PVs (Appendix M) (negative quantit	y)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (332)(237	'b) =	4314.88	(338)
12b. CO2 Emissions – Community heating scheme				
	Employe Employe	am factor [
	Energy Emiss kWh/year kg CO	on factor E 2/kWh k	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CF	kWh/year kg CO.	2/kWh k		
	kWh/year kg CO	2/kWh k		(367a)
Efficiency of heat source 1 (%) If there is CHP	kWh/year kg CO.	2/kWh k	kg CO <mark>2/yea</mark> r	(367a) (367)
Efficiency of heat source 1 (%) If there is CHP	kWh/year kg CO. IP) using two fuels repeat (363) to (366) for the	2/kWh ke second fuel scan =	kg CO2/year	J
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(30)	kWh/year kg CO IP) using two fuels repeat (363) to (366) for the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the	2/kWh ke second fuel scan =	256 895.68	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(30) Electrical energy for heat distribution	kWh/year kg CO IP) using two fuels repeat (363) to (366) for the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the	2/kWh keesecond fuel s2 = s2 = = =	256 895.68 22.93	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(30) Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO. IP) using two fuels repeat (363) to (366) for the repeat (363) to (366) for the repeat (363) x	2/kWh kene second fuel 52 = 52 = = = = =	256 895.68 22.93 918.61	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO IP) using two fuels repeat (863) to (366) for the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the c	2/kWh kene second fuel 52 = 52 = = = = =	256 895.68 22.93 918.61	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within decompositions.	kWh/year kg CO: IP) using two fuels repeat (363) to (366) for the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the point of the po	2/kWh kene second fuel 52 = 52 = = = = = = = = = = = = = = = =	256 895.68 22.93 918.61 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dw CO2 associated with electricity for lighting	kWh/year kg CO: IP) using two fuels repeat (363) to (366) for the repeat (363) to (366) for the repeat (313) x (363)(366) + (368)(372) (309) x (309) x caneous heater (312) x (373) + (374) + (375) = velling (331)) x (332))) x 0.5	2/kWh kene second fuel	256 895.68 22.93 918.61 0 918.61](367)](372)](373)](374)](375)](376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within decompositions.	kWh/year kg CO: IP) using two fuels repeat (363) to (366) for the repeat (363) to (366) for the repeat (313) x (363)(366) + (368)(372) (309) x (309) x caneous heater (312) x (373) + (374) + (375) = velling (331)) x (332))) x 0.5	2/kWh kene second fuel	256 895.68 22.93 918.61 0 918.61 61.35](367)](372)](373)](374)](375)](376)](378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(30) Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dw CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applied to	kWh/year kg CO: IP) using two fuels repeat (363) to (366) for the strong two fuels repeat (367b) x [(313) x	2/kWh kene second fuel 52 = 52 = 22 = 52 = 52 = 52 = 52 = 52 = 52 = 53 = 54 = 55 = 55 = 56 = 57 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 =	256 895.68 22.93 918.61 0 918.61 61.35 154.05	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(30) Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within do CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applied to	kWh/year kg CO: IP) using two fuels repeat (363) to (366) for the strong two fuels repeat (367b) x [(313) x	2/kWh kene second fuel 52 = 52 = 22 = 52 = 52 = 52 = 52 = 52 = 52 = 53 = 54 = 55 = 55 = 56 = 57 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 =	256 895.68 22.93 918.61 0 918.61 61.35 154.05	(367) (372) (373) (374) (375) (376) (378) (379) (380)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(30) Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within do CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applied to the community systems Total CO2, kg/year sum of (376)(382) =	kWh/year kg CO: IP) using two fuels repeat (363) to (366) for the strong two fuels repeat (367b) x [(313) x	2/kWh kene second fuel 52 = 52 = 22 = 52 = 52 = 52 = 52 = 52 = 52 = 53 = 54 = 55 = 55 = 56 = 57 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 = 58 =	256 895.68 22.93 918.61 0 0 918.61 61.35 154.05 -268.93 865.08](367)](372)](373)](374)](375)](376)](378)](379)](380)](383)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	112		Strom				Versic	on: 1.0.5.51	
			roperty	Address			tom)			
Address :						()	,			
1. Overall dwelling dimer	nsions:									
Ground floor			_	a(m²) 66.25	(1a) x	Av. He	eight(m)	(2a) =	Volume(m) 198.75	³)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 6	66.25	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	198.75	(5)
2. Ventilation rate:										
Number of chimneys	heating	secondar heating	у П + Г	other	7 = [total	x	40 =	m³ per hou	ır (6a
•		0	」	0]	0		20 =	0	=
Number of open flues		0	J Ť L	0] - [0			0	(6b
Number of intermittent fan	S				Ĺ	2		10 =	20	(7a
Number of passive vents		_			L	0	X	10 =	0	(7b
Number of flueless gas fire	es					0	X	40 =	0	(7c
								Air ch	nanges <mark>per</mark> he	our
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7	′a)+(7b)+((7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has be	en ca <mark>rried o</mark> ut or is inten	ded, procee	d to (17),	otherwise (continue f	rom (9) to				``
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration			2.25 ([(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2 if both types of wall are pre					•	ruction			0	(11
deducting areas of opening		osponding to	The great	ior wan arc	a (antor					
If suspended wooden flo	oor, enter 0.2 (unse	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente									0	(13
Percentage of windows	and doors draught	stripped		0.05 (0.0		4001			0	(14
Window infiltration				0.25 - [0.2	. ,	-	. (4E)		0	(15
Infiltration rate	FO everenced in a	ibia matra	a nar h	(8) + (10)				oroo	0	(16
Air permeability value, out of the Air permeability value, or air permeability and the Air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeability value, or air permeabilit	•		•	•	•	ietre or e	envelope	area	5	(17
Air permeability value applies	-					is being u	ısed		0.35	(18
Number of sides sheltered					·	ŭ			2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.3	(21
Infiltration rate modified fo	r monthly wind spee	ed							,	
Jan Feb M	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
, ,						1			J	

Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	T	I	1	ı	
0.38 Calculate effe	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
If mechanica		•	iale ioi l	пе аррп	Cable Ca	SE						0	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	n heat reco	very: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100]	`
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)	•	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse ext			•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation								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		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	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. Heat losse	s and he	at loss r	paramet	jr.					_			_	
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>					2.4	Х	1	=	2.4				(20
Vindows Type	1				1.24	x1.	/[1/(1.4)+	0.04] =	1.64				(27
Vindows Type	2				8.8	x1.	/[1/(1.4)+	0.04] =	11.67				(2
Vindows Type	3				4.12	х1	/[1/(1.4)+	0.04] =	5.46				(2
loor					66.25	5 X	0.13	=	8.61249	9			(2
Valls Type1	31.8	3	12.9	2	18.88	3 X	0.18	= [3.4	\Box [(2
Valls Type2	18.7	5	1.24		17.5	X	0.18	=	3.15				(29
Valls Type3	11.1		2.4		8.7	Х	0.18	=	1.57				(29
Valls Type4	2.4		0		2.4	х	0.18	<u> </u>	0.43	$\overline{}$		$\overline{}$	(29
otal area of e	lements,	, m²			130.3	3							(3:
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions		(00) (00)) . (22)				T	
abric heat los		,	U)				(26)(30)		(00) (0)	a) (00)	(00.)	38.33	==
leat capacity	•	,	O	TEA):	- I- I/21/			., ,	(30) + (32	, , ,	(32e) =	5633.6	
hermal mass	•	,		,			raciaaly the		tive Value		abla 1f	250	(3:
or design assess an be used inste				CONSTRUCT	ion ale 110	k KITOWIT PI	ธ บเจ ษ เฎ เกิด	= IIIUICALIVE	vaiues Of	TIVIT III I	abic II		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						6.52	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)								
otal fabric he								(33) +	(36) =			44.85	(3
entilation hea		lculated	monthly	/	•				= 0.33 × (25)m x (5)) I	I	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Heat transfer coefficient, W/K (39)m = 82.38 82.19 82.01 81.17 81.01 80.27 80.27 80.13 80.56 81.01 81.33 81.66 Average = Sum(39) ₁₁₂ /12= 81.17 (39) Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) (40)m = (39)m ÷ (4) Average = Sum(40) ₁₁₂ /12= 1.23 (40) Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		i	i	i			i	ı			·	i	1	
Casima	(38)m= 37.53	37.35	37.16	36.32	36.16	35.42	35.42	35.29	35.71	36.16	36.48	36.82		(38)
Heat loss parameter (HLP), Wim³K (40)me 124 124 124 123 122 121 121 121 121 122 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123 123									` ′				1	
Heat loss parameter (HLP), W/m²K (40)m= 1.24	(39)m= 82.38	82.19	82.01	81.17	81.01	80.27	80.27	80.13				<u> </u>	04.47	7(20)
Average = Sum(40)/12= 1.23 (40)		meter (H	HLP), W/	/m²K			Г	1		_		12 /12=	81.17	(39)
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(40)m= 1.24	1.24	1.24	1.23	1.22	1.21	1.21	1.21						¬
A. Water heating energy requirement. Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupancy, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N Assumed occupance, N As	Number of day	rs in moi	nth (Tah	le 1a)					,	Average =	Sum(40)₁	12 /12=	1.23	(40)
4. Water heating energy requirement: Assumed occupancy, N		i	`		Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
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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= 139.15	(44)m= 93.83	90.42	87.01	83.6	80.19	76.77	76.77	80.19					4000.05	7(44)
Total = Sum(45)	Energy content of	hot wa <mark>ter</mark>	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,		1023.05	(44)
### ### ##############################	(45)m= 139.15	121.71	125.59	109.49	105.06	90.66	84.01	96.4	97.55	113.69	124.1	134.76		
(46)m= 20.87 18.26 18.84 16.42 15.76 13.6 12.6 14.46 14.63 17.05 18.61 20.21 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (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): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) Up the storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)	_									Γotal = Su	m(45) ₁₁₂ =	_	1342.17	(45)
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Energy lost from water storage, kWh/year (48) × (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) (55) (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m × [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48)
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Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56) $m = (23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.58 23.33 23.$	-	_		011 4.0								0		(52)
Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H	Temperature fa	actor fro	m Table	2b										
Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H	Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	••		-						·		-			
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m			•	
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)		s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ı lix H	
	(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) from	Гable 3							0		(58)
Primary circuit loss calculated for e		59)m = (5	58) ÷ 36	55 × (41)	m					
(modified by factor from Table H	5 if there is s	olar wate	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01 23.26 22	2.51 23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each mo	onth (61)m =	(60) ÷ 36!	5 × (41)	ım		•	•			
	0 0	0	0	0	0	0	0	0		(61)
Total heat required for water heati	ng calculated	for each	month	(62)m =	0.85 x (/45)m +	(46)m +	(57)m +	(59)m + (61)m	
	4.58 151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		(62)
Solar DHW input calculated using Appendi						<u> </u>	l			
(add additional lines if FGHRS and								3,		
·	0 0	0	0	0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0	0	0	0	0	0		(63) (G2
Output from water heater										
·	4.58 151.65	135.75	130.6	143	142.64	160.28	169.19	181.36		
, ,	 	<u> </u>		Outp	out from wa	L ater heate	<u>l</u> r (annual)₁	12	1890.79	(64)
Heat gains from water heating, kW	/h/month 0 2!	5 ´ [0 85 x	x (45)m	+ (61)m	n1 + 0 8 x	([(46)m	+ (57)m	+ (59)m	1	_
	2.48 72.21	66.22	65.21	69.33	68.51	75.08	77.34	82.08	J	(65)
include (57)m in calculation of (6									eating	
1 1	1 1	yiiildei is	III tilo c	Aweiling	Of flot w	ater is in	OIII COIII	indinity in	calling	
5. Internal gains (see Table 5 an	d Sa).					-			_	
Metabolic gains (Table 5), Watts	\nr \May	lun	Jul		Con	Oct	Nov	Doo		
	Apr May 7.59 107.59	Jun 107.59	107.59	Aug 107.59	Sep 107.59	Oct 107.59	Nov 107.59	Dec 107.59		(66)
						107.59	107.59	107.39		(00)
Lighting gains (calculated in Appe	-					40.0	40.00	47.00		(67)
` '	6.88	5.81	6.27	8.15	10.94	13.9	16.22	17.29		(07)
Appliances gains (calculated in Ap	 									(00)
` '	4.93 161.69		140.94	138.98	143.91	154.4	167.64	180.08		(68)
Cooking gains (calculated in Appe			 				1			(22)
(69)m= 33.76 33.76 33.76 33	33.76	33.76	33.76	33.76	33.76	33.76	33.76	33.76		(69)
Pumps and fans gains (Table 5a)	<u>, </u>					T	T	·		
(70)m= 3 3 3	3 3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporation (negative	values) (Tab	le 5)								
(71)m= -86.07 -86.07 -86.07 -8	6.07 -86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07	-86.07		(71)
Water heating gains (Table 5)										
(72)m= 112.29 110.32 106.23 10	0.67 97.05	91.97	87.65	93.18	95.15	100.91	107.41	110.33		(72)
Total internal gains =		(66)m	n + (67)m	+ (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m= 375.78 373.89 362.08 34	3.07 323.9	305.3	293.13	298.6	308.28	327.48	349.54	365.97		(73)
6. Solar gains:										
Solar gains are calculated using solar flux	from Table 6a	and associa	ited equa	tions to co	nvert to th	e applicab	le orientat	ion.		
	Area	Flux		_	g_ 	-	FF		Gains	
Table 6d	m²	ı abl	le 6a	. <u></u>	able 6b		able 6c		(W)	_
North 0.9x 0.77 x	8.8	x 10).63	X	0.63	×	0.7	=	28.6	(74)

	_					-		_						
North	0.9x	0.77		X	4.12	X	10.63	X	0.63	X	0.7	=	13.39	(74)
North	0.9x	0.77		X	8.8	X	20.32	X	0.63	x	0.7	=	54.65	(74)
North	0.9x	0.77		x	4.12	X	20.32	X	0.63	x	0.7	=	25.59	(74)
North	0.9x	0.77		x	8.8	X	34.53	x	0.63	x	0.7		92.87	(74)
North	0.9x	0.77		x	4.12	X	34.53	х	0.63	x	0.7	=	43.48	(74)
North	0.9x	0.77		x	8.8	X	55.46	X	0.63	x	0.7	=	149.17	(74)
North	0.9x	0.77		x	4.12	X	55.46	X	0.63	x	0.7	=	69.84	(74)
North	0.9x	0.77		x	8.8	X	74.72	X	0.63	x	0.7	=	200.94	(74)
North	0.9x	0.77		x	4.12	X	74.72	X	0.63	x	0.7	=	94.08	(74)
North	0.9x	0.77		x	8.8	X	79.99	X	0.63	x	0.7		215.11	(74)
North	0.9x	0.77		x	4.12	X	79.99	X	0.63	x	0.7	=	100.71	(74)
North	0.9x	0.77		x	8.8	X	74.68	X	0.63	x	0.7	=	200.83	(74)
North	0.9x	0.77		x	4.12	X	74.68	X	0.63	x	0.7	=	94.03	(74)
North	0.9x	0.77		x	8.8	X	59.25	X	0.63	x	0.7	=	159.34	(74)
North	0.9x	0.77		x	4.12	X	59.25	X	0.63	x	0.7	=	74.6	(74)
North	0.9x	0.77		x	8.8	X	41.52	X	0.63	x	0.7	=	111.65	(74)
North	0.9x	0.77		x	4.12	X	41.52	x	0.63	x	0.7	=	52.27	(74)
North	0.9x	0.77		x	8.8	X	24.19	Х	0.63	Х	0.7	=	65.05	(74)
North	0.9x	0.77		x	4.12	х	24.19	x	0.63	х	0.7	=	30.46	(74)
North	0.9x	0.77		x	8.8	х	13.12	x	0.63	х	0.7	=	35.28	(74)
North	0.9x	0.77		x	4.12	x	13.12	x	0.63	х	0.7	=	16.52	(74)
North	0.9x	0.77		x	8.8	X	8.86	Х	0.63	x	0.7	=	23.84	(74)
North	0.9x	0.77		x	4.12	x	8.86	X	0.63	х	0.7		11.16	(74)
West	0.9x	0.77		x	1.24	х	19.64	x	0.63	x	0.7	=	7.44	(80)
West	0.9x	0.77		x	1.24	x	38.42	x	0.63	x	0.7	_	14.56	(80)
West	0.9x	0.77		x	1.24	X	63.27	X	0.63	x	0.7	=	23.98	(80)
West	0.9x	0.77		x	1.24	X	92.28	x	0.63	x	0.7	=	34.97	(80)
West	0.9x	0.77		x	1.24	X	113.09	x	0.63	x	0.7	=	42.86	(80)
West	0.9x	0.77		x	1.24	X	115.77	x	0.63	x	0.7	=	43.87	(80)
West	0.9x	0.77		x	1.24	X	110.22	x	0.63	x	0.7	=	41.77	(80)
West	0.9x	0.77		x	1.24	X	94.68	X	0.63	x	0.7	=	35.88	(80)
West	0.9x	0.77		x	1.24	X	73.59	X	0.63	x	0.7	=	27.89	(80)
West	0.9x	0.77		x	1.24	X	45.59	x	0.63	x	0.7	=	17.28	(80)
West	0.9x	0.77		x	1.24	x	24.49	x	0.63	×	0.7		9.28	(80)
West	0.9x	0.77		x	1.24	x	16.15	x	0.63	×	0.7		6.12	(80)
	_													_
Solar g	ains in	watts, ca	alcula	ated	for each mon	th		(83)m	n = Sum(74)m .	(82)m			•	
(83)m=	49.43	94.8	160.		253.97 337.8		336.63	269	.81 191.82	112.79	61.08	41.12		(83)
Ī					(84)m = (73) r					-		1	I	
(84)m=	425.21	468.68	522	.4	597.05 661.7	8	665 629.77	568	.41 500.1	440.27	410.62	407.1		(84)
7. Mea	an inter	nal temp	eratu	ıre (heating seaso	on)								
Temp	erature	during h	eatin	ıg pe	eriods in the li	ving	area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains f	for li	ving area, h1	,m (s	ee Table 9a)						 I	
	Jan	Feb	Ma	ar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
04	-O A D 004	10 \/ '	405	F4 (C	:AD 0 02\ http:/	<i>t</i>	-1						D	5 of 7

Mean internal temperature in the rest of dwelling) = fLA x T1 + (1-fLA) x T2 18.75 18.85 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75 18.75															
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Comparison 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	' in Table	e 9c)					
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Utilisation factor for gains for rest of dwelling, h.2,m (see Table 9a) (89)m	Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m= 1.8.13 18.82 18.7 19.23 19.66 19.87 19.91 19.91 19.77 19.23 18.6 18.1 (90) (18.73 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92) (92)m= 18.76 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92) (93)m= 18.76 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.83 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93) (93)m= 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93)m= 18.76 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.17 18.74 (93)m= 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18 19.18	(88)m=	19.89	19.89	19.89	19.9	19.9	19.91	19.91	19.91	19.91	19.9	19.9	19.89		(88)
Man internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m 18.13 18.32 18.7 19.23 19.66 19.87 19.91 19.91 19.77 19.23 16.6 18.11 (90) (1.4 - L) \text{Virging area + (4)} =	Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
Solution 18.13 18.32 18.7 19.23 19.66 19.87 19.91 19.91 19.71 19.23 18.66 18.1 (9)	(89)m=	1	0.99	0.98	0.95	0.83	0.61	0.42	0.49	0.8	0.97	0.99	1		(89)
Solution 18.13 18.32 18.7 19.23 19.66 19.87 19.91 19.91 19.71 19.23 18.66 18.1 (9)	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)			•	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 18.76				r						r 1		18.6	18.1		(90)
(92) (92) (92) (92) (18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92)										f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
(92) (92) (92) (92) (18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (92)	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) x T2					
33 18.76 18.93 19.26 19.72 20.11 20.31 20.35 20.34 20.2 19.72 19.17 18.74 (93)				· `	i			i	· `	<u> </u>	19.72	19.17	18.74		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.65 0.47 0.54 0.82 0.96 0.99 1 Useful gains, hmGrn. W = (94)m x (84)m (95)m 423.1 464.73 512.49 563.19 555.3 431.57 296.43 307.45 410.43 424.55 406.86 405.45 Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 144.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((97)m - (95)m) x ((97)m - (1191.45 1153.28 1046.23 878.35 881.52 458.31 300.96 315.97 491.67 738.8 981.8 1187.27 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 571.65 462.7 397.1 226.91 39.91 0 0 0 0 233.81 413.96 581.67 Space heating: Fraction of space heat from secondary/supplementary systems including micro-CHP) Space heating: Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = (202) x [1 - (203)] = (2	Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
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 0.94 0.84 0.65 0.47 0.54 0.82 0.96 0.99 1 Useful gains, hmGm . W = (94)m x (84)m (95)m= 423.1 464,73 \$12.49 \$65.19 \$55.3 431.57 \$296.43 \$307.45 410.43 424.55 406.86 405.45 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14/6 16/6 16/4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) 1 (97)m= 1191.45 1153.28 1046.23 878.35 681.52 458.31 300.96 315.97 491.67 738.8 981.8 1187.27 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= \$571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 Total per year (kWh/year) = Sum(98). 58.07 = 2981.71 (98) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system. % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 482.7 397.1 226.91 93.91 0 0 0 0 0 233.81 413.96 581.67 (211)m = {(198)m x (204)} } x 100 + (206)	(93)m=	18.76	18.93	19.26	19.72	20.11	20.31	20.35	20.34	20.2	19.72	19.17	18.74		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Spa	ace hea	ting requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 1	tne ut			Ĭ			lun	l. d		Con	Oct	Nov	Doo		
(94) (94) (94) (95) (94) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (9	l Itilies					iviay	Jun	Jui	Aug	Sep	Oct	NOV	Dec		
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(95)me		I gains,	hmGm .			4)m									
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Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 1191.45 1153.28 1046.23 878.35 881.52 458.31 300.96 315.97 491.67 738.8 981.8 1187.27 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (98) (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98)m = 10.00 (98	Month	nly avera	age exte	rnal tem	perature	from T	able 8								
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 571.65	Heat I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	Г	ı	ı	
Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system O (201)	` '											<u> </u>	1187.27		(97)
Space heating requirement in kWh/m²/year 2981.71 (98)										i ì				I	
Space heating requirement in kWh/m²/year 45.01 (99) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 233.81 413.96 581.67 (211) m = {[(98) m x (204)] } x 100 ÷ (206) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) ((98)m=	571.65	462.7	397.1	226.91	93.91	0	0							(oo)
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Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 571.65 462.7 397.1 226.91 93.91 0 0 0 0 0 233.81 413.96 581.67 (211)m = {[[98)m x (204)] } x 100 ÷ (206) (211) 611.39 494.87 424.71 242.69 100.44 0 0 0 0 0 250.06 442.73 622.11	Space	e heatin	g require	ement in	kWh/m²	/year								45.01	(99)
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Fraction of space heat from main system(s)	•		_			/		1							(oot)
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Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year				•	-				(204) = (2)	02) × [1 – ((203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above)	Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	າ, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	year
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ (211) $	Space	e heatin	g require	ement (c	alculate	d above)						ı	ı	
611.39 494.87 424.71 242.69 100.44 0 0 0 0 250.06 442.73 622.11		571.65	462.7	397.1	226.91	93.91	0	0	0	0	233.81	413.96	581.67		
	(211)m	= {[(98)m x (20	4)] } x 1	00 ÷ (20	6)	•	•				•			(211)
$Total (kWh/vear) = Sum(211) \dots = 3180 $ (211)		611.39	494.87	424.71	242.69	100.44	0	0							
715,1012									Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3189	(211)

(215)m = 0 0 0 0 0	0	0	0	0	0	0	0		
				-	_	215) _{15,1012}	_	0	(215)
Water heating				` ,	, ,	715,1012	l		(,
Output from water heater (calculated above)									
	35.75	130.6	143	142.64	160.28	169.19	181.36		_
Efficiency of water heater		-						79.8	(216)
` '	79.8	79.8	79.8	79.8	85.82	87.11	87.7		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	70.11	163.66	179.19	178.75	186.77	194.22	206.78		
			Tota	I = Sum(2	19a) ₁₁₂ =	-		2238.34	(219)
Annual totals					k\	Wh/year	, 	kWh/year	¬
Space heating fuel used, main system 1							ļ	3189	╣
Water heating fuel used								2238.34	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/year			sum	of (230a).	(2 30g) =			75	(231)
Electricity for lighting									
Lieutholty for lighting								297.09	(232)
Total delivered energy for all uses (211)(221) +	(231)	+ (232)	(237b)	=				297.09 5799.42	(232)
Total delivered energy for all uses (211)(221) +					ı				╡`
	s inclu	iding mid						5799.42	(338)
Total delivered energy for all uses (211)(221) +	s inclu				Emiss kg CO	ion fac 2/kWh	tor		(338)
Total delivered energy for all uses (211)(221) +	EnckW	iding mid				2/kWh	tor =	5799.42	(338)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1)	EnckW	ergy h/year			kg CO	2/kWh		5799.42 Emissions kg CO2/ye	(338) (338) ar
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary)	Enc kW (211	ergy h/year			kg CO2	2/kWh	= [5799.42 Emissions kg CO2/ye	(338) ar
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219	ergy h/year) ×	cro-CHP		0.2°	2/kWh	=	5799.42 Emissions kg CO2/yes 688.82 0	(338) ar (261)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary)	End kW (211 (215 (219 (261	ergy h/year) x) x	cro-CHP		0.2°	2/kWh 16 19	=	5799.42 Emissions kg CO2/yes 688.82 0 483.48	(338) (338) (338) (261) (263) (264)
Total delivered energy for all uses (211)(221) + 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	End kW (211 (215 (219 (261 (231	ergy h/year x x x x x y x y x y x y x y x y x y x	cro-CHP		0.2°	2/kWh 16 19 16	=	5799.42 Emissions kg CO2/ye 688.82 0 483.48 1172.3	(338) (338) (338) (261) (263) (264) (265)

TER =

(273)

20.61

SAP Input

Property Details: Sample 3 (Bottom)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height: $0 67 \text{ m}^2 3 \text{ m}$

Floor 0 67 m² 3 m

Living area: 27.3 m² (fraction 0.407)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	:	Argon:	Frame:
DOO	R	Manufactur <mark>e</mark>	er Solid				Wood
Ε		Manufacture	er Windows	low-E, En	= 0.05, soft coa	t No	
S		Manufacture	er Windows	low-E, En	= 0.05, soft coa	t No	
Balco	ony	Manufactur <mark>e</mark>	er Windows	low-E, En	= 0.05, soft coa	t No	

Name:	Gap:	Frame Fac	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
E		Е	East	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>:S</u>						
S	31.65	10.24	21.41	0.15	0	False	N/A
E	2.3	1.44	0.86	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	67			0.11			N/A

Internal Elements
Party Elements

SAP Input

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 3 (Bottom) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3 (2a) = (3a) 67 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) total main secondary other m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (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

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m = 0	Adjusted infiltra	ation rate	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m				-	
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0				· ·	-	i -	· ·	0.12	0.13	0.14	0.14	0.15		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =			•	iale ioi l	пе аррп	Cable Ca	36						0.5	(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ± 100] 24a)m = 0.27	If exhaust air he	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
24a)m 0 .27	If balanced with	heat reco	very: effic	eiency in %	allowing t	or in-use f	actor (fron	n Table 4h) =				79.05	5 (23
b) If balanced mechanical ventiliation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(24
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24d)m = 0	b) If balance	d mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	o)m = (22	2b)m + (23b)	_	_	
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24e m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] 24d)m = 0	,				•					.5 × (23b	o)			
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 28im 0.27 0.26 0.26 0.25 0.24 0.23 0.23 0.22 0.23 0.24 0.25 0.25 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25/m=	,				•	•				0.5]			_	
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings Net Area (W/K) Vindows Type 1 Vindows Type 2 Vindows Type 3 Vindows Type 1 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 3 I 1.44 Vindows Type 2 Vindows Type 3 I 1.44 Vindows Type 3 Vindows Type 4 Vindows Type 3 Vindows Type 3 Vindows Type 4 Vindows Type 4 Vindows Type 5 Vindows Type 6 Vindows Type 7 Vindows Type 8 Vindows Type 9 Vindows Type 9 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 3 Vindows Type 3 Vindows Type 3 Vindows Type 3 Vindows Type 1 Vindows Type 3 Vindows Type 3 Vindows Type 3 Vindows Type 3 Vindows Type 1 Vindows Type 1 Vindows Type 3 Vindows Type 3 Vindows Type 3 Vindows Type 1 Vindows Type 3 Vindows Type 3 Vindows Type 3 Vindows Type 1 Vindows Type 3 Vindows Type 1 Vindows Type 3 Vindows Type 1 Vindows Type 3 Vindows Type 1 Vindows Type 3 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Type 1 Vindows Vindows A, M. V. V. V. V. V. V. V. V. V. V. V. V. V.	24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
3. Heat osses and heat loss parameter: ELEMENT Gross area (m²) Doors Vindows Type 1 Vindows Type 2 Vindows Type 3 Floor Valls Type 1 Valls Type 2 Valls Type 3 Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² Total area of elements, m² T	Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
Net Area	25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
Net Area	3. Heat losses	s and he	eat loss	oaram e t	er:							_	_	
2.4						Net Ar	ea							ΑΧk
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Stoor						5.44				5.23	닉			(2)
Valls Type1 31.65 10.24 21.41 × 0.15 = 3.21	• • • • • • • • • • • • • • • • • • • •	: 3				4.8	X	1/[1/(1)+	0.04] =	4.62	ᆗ ,			(2
Valls Type2 2.3 1.44 0.86 0.15 1.3 Valls Type4 2.4 0.15 1.3 Valls Type4 2.4 0.2.4 0.35 11.45 Indicative Value: Medium 2.7 Indicative Values of TMP in Table 1f an be used instead of a detailed calculated using Appendix K details of thermal bridges: S (L x Y) calculated using Appendix K details of thermal bridging are not known (36) = 0.05 x (31) indicative heat loss (33) + (36) = 0.13 0.15 1.3 0.15 1.3 0.15 1.3 0.15 1.3 0.84 0.86 0.15 1.3 0.84 0.86 0.15 1.3 0.84 0.86 0.15 1.3 0.84 0.86 0.15 1.3 0.84 0.86 0.15 1.3 0.84 0.86 0.87 0.87 0.87 0.88 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89						67	X	0.11	= !	7.37	_		_	(2
Valls Type3 11.1 2.4 8.7 X 0.15 1.3 Valls Type4 2.4 0 2.4 X 0.35 Valls Type4 2.4 X 0.35 Valls Type4 2.4 X 0.35 Valls Type4 Indicative Value: Medium Indicative Value: Medium Indicative Values of TMP in Table 1f and be used instead of a detailed calculated using Appendix K Indication of thermal bridging are not known (36) = 0.05 x (31) Valls Type3 11.1 2.4 8.7 X 0.15 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 Value 1.3 V		31.6	55	10.2	4	21.4	X	0.15	= !	3.21	_		_	(2
Valls Type4 2.4 0 2.4 x 0.35 = 0.84 Total area of elements, m² 114.45 for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (29)(30) + (32) + (32a)(32e) = (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (30) + (3		2.3		1.44	<u> </u>	0.86	X	0.15	= !	0.13	_		_	(29
Total area of elements, m ² for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = 5492.18 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 44.61	• •	11.1	1	2.4	_	8.7	x	0.15	=	1.3	<u> </u>		_	(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 x U) Heat capacity Cm = S(A x k) Chermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 Thermal bridges : S (L x Y) calculated using Appendix K Indicative values of TMP in Table 1f Indicative values of the male of the construction are not known precisely the indicative values of TMP in Table 1f Indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative values of the indicative val	• •	L		0		2.4	x	0.35	=	0.84	[(2
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Fabric heat loss, W/K = S (A x U) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capacity Cm = S(A x k) Reat capa							ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative Value: Medium 250 17.17 17.17 17.17 17.17 18.18 19.18 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19 19.19					•			(26)(30) + (32) =				27.44	1 (3
for design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 44.61	leat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =		
an be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 44.61	hermal mass	parame	ter (TMF	c = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
details of thermal bridging are not known (36) = $0.05 \times (31)$ fotal fabric heat loss (33) + (36) = 44.61	· ·				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
(33) + (36) =	hermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						17.17	7 (3
			are not kn	nown (36) =	= 0.05 x (3	11)								
entilation neat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$											· ·		44.61	1 (3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				· ·						<u> </u>		i _	1	

		ı	i			i	1			i		Í	
(38)m= 17.73	17.52	17.31	16.25	16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer of								· · · ·	= (37) + (1	
(39)m= 62.34	62.13	61.92	60.86	60.65	59.59	59.59	59.38	60.02	60.65	61.07	61.5	60.94	(39)
Heat loss parar	meter (H	HLP), W	m²K						= (39)m ÷	Sum(39) ₁ .	12 / 1 Z=	60.81	(39)
(40)m= 0.93	0.93	0.92	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.91	0.92		_
Number of days	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.91	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
										•	•		
4. Water heati	ing enei	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	nancy I	N									.17		(42)
if TFA > 13.9 if TFA £ 13.9), N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		. 17	,	(42)
Annual average	e hot wa										5.76		(43)
Reduce the annual not more that 125	_		• .		-	-	to achieve	a water us	se target o	f			
Jan	Feb	Mar	· ` `	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in			Apr ach month	,				Sep	Oct	INOV	Dec		
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
` / []										m(44) ₁₁₂ =		1029.18	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		_
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous wa	ater heati	na at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1349.41	(45)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage				10101	10101							ı	, ,
Storage volume	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	•			•			` '		(01.1				
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufactu		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b			• •					0		(49)
Energy lost from	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10		(50)
b) If manufactu			-									ı	
Hot water stora	-			e 2 (kW	n/litre/da	ıy)				0.	.02		(51)
Volume factor f	_		011 4.0							1.	.03		(52)
Temperature fa	actor fro	m Table	2b							—	.6		(53)
Energy lost from	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or (54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)r	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	i8)
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 22.51 23.26 (59)m= 23.26 21.01 23.26 22.51 23.26	i9)
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 (61)	51)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m	
(62)m= 195.18 172.29 181.54 163.58 160.9 144.64 139.74 152.2 151.57 169.58 178.26 190.77 (62)	52)
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	3)
FHRS 18.03 16.04 16.49 14.58 14.03 12.18 11.28 12.94 13.08 15.09 16.32 17.54 (63	63) (G2
Output from water heater	
(64)m= 174.47 153.83 162.37 146.4 144.19 129.86 125.78 136.58 135.89 151.81 159.35 170.55	
Output from water heater (annual) ₁₁₂ 1791.08 (64	34)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 90.74 80.63 86.21 79.4 79.34 73.1 72.31 76.45 75.41 82.23 84.28 89.27 (65)m=	35)
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= 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 108.56 (66)	se)
	,0)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27)
(67)m= 17.86 15.86 12.9 9.77 7.3 6.16 6.66 8.66 11.62 14.75 17.22 18.36 (67)m= 17.86 15.86 12.9 9.77 7.3 6.16 6.66 8.66 11.62 14.75 17.22 18.36) <i>(</i>)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 190.2 192.17 187.2 176.61 163.24 150.68 142.29 140.32 145.29 155.88 169.24 181.8 (68)	i8)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 33.86 (69)m=	i9)
Pumps and fans gains (Table 5a)	
(70)m =	′0)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 (71)m= -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -86.85 -8	'1)
Water heating gains (Table 5)	
(72)m= 121.96 119.98 115.87 110.27 106.64 101.53 97.18 102.75 104.73 110.52 117.06 119.99 (72)	' 2)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 385.59 383.58 371.53 352.22 332.75 313.94 301.7 307.29 317.21 336.72 359.09 375.72 (73)m= 385.59 383.58 371.53 352.22 332.75 313.94 301.7 307.29 317.21 336.72 359.09 375.72	′ 3)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m² Table 6a Table 6b Table 6c (W)	
East 0.9x 0.77 x 1.44 x 19.64 x 0.4 x 0.7 = 5.49 (76	' 6)

East	0.9x	0.77	X	1.44	X	3	8.42	X	0.4	X	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.44	X	6	3.27	x	0.4	X	0.7	=	17.68	(76)
East	0.9x	0.77	X	1.44	X	9	2.28	х	0.4	X	0.7	=	25.78	(76)
East	0.9x	0.77	X	1.44	X	1	13.09	x	0.4	X	0.7	=	31.6	(76)
East	0.9x	0.77	X	1.44	X	1	15.77	x	0.4	X	0.7	_	32.35	(76)
East	0.9x	0.77	X	1.44	X	1	10.22	x	0.4	X	0.7	=	30.8	(76)
East	0.9x	0.77	X	1.44	X	9	4.68	x	0.4	X	0.7	=	26.45	(76)
East	0.9x	0.77	X	1.44	X	7	3.59	x	0.4	X	0.7	_	20.56	(76)
East	0.9x	0.77	X	1.44	X	4	5.59	x	0.4	X	0.7	=	12.74	(76)
East	0.9x	0.77	X	1.44	X	2	4.49	x	0.4	X	0.7	=	6.84	(76)
East	0.9x	0.77	X	1.44	X	1	6.15	x	0.4	X	0.7	_	4.51	(76)
South	0.9x	0.77	X	5.44	X	4	6.75	x	0.4	X	0.7		49.35	(78)
South	0.9x	0.77	X	4.8	X	4	6.75	x	0.4	x	0.7		43.54	(78)
South	0.9x	0.77	X	5.44	X	7	6.57	x	0.4	x	0.7	=	80.82	(78)
South	0.9x	0.77	x	4.8	X	7	6.57	x	0.4	x	0.7	=	71.31	(78)
South	0.9x	0.77	X	5.44	X	9	7.53	x	0.4	x	0.7	-	102.95	(78)
South	0.9x	0.77	X	4.8	X	9	7.53	x	0.4	x	0.7	=	90.84	(78)
South	0.9x	0.77	x	5.44	X	1	10.23	Х	0.4	Х	0.7	=	116.36	(78)
South	0.9x	0.77	X	4.8	i x	1	10.23	x	0.4	х	0.7		102.67	(78)
Sout <mark>h</mark>	0.9x	0.77	X	5.44	x	1	14.87	x	0.4	х	0.7	=	121.26	(78)
Sout <mark>h</mark>	0.9x	0.77	X	4.8	5 x	1	14.87	x	0.4	х	0.7	=	106.99	(78)
South	0.9x	0.77	j x	5.44	X	1	10.55	Х	0.4	х	0.7		116.69	(78)
South	0.9x	0.77	×	4.8	i x	1	10.55	х	0.4	х	0.7	=	102.96	(78)
South	0.9x	0.77	j x	5.44	x	10	08.01	x	0.4	х	0.7	=	114.01	(78)
South	0.9x	0.77	X	4.8	X	10	08.01	x	0.4	х	0.7		100.6	(78)
South	0.9x	0.77	X	5.44	X	10	04.89	x	0.4	х	0.7	=	110.72	(78)
South	0.9x	0.77	x	4.8	X	10	04.89	x	0.4	x	0.7	=	97.7	(78)
South	0.9x	0.77	x	5.44	i x	10	01.89	x	0.4	x	0.7	<u> </u>	107.55	(78)
South	0.9x	0.77	X	4.8	X	10	01.89	x	0.4	x	0.7	=	94.9	(78)
South	0.9x	0.77	X	5.44	i x	8	2.59	x	0.4	x	0.7	=	87.18	(78)
South	0.9x	0.77	x	4.8	i x	8	2.59	x	0.4	x	0.7	<u> </u>	76.92	(78)
South	0.9x	0.77	x	5.44	X	5	5.42	x	0.4	x	0.7	=	58.5	(78)
South	0.9x	0.77	×	4.8	j x	5	5.42	x	0.4	x	0.7	=	51.62	(78)
South	0.9x	0.77	X	5.44	i x		10.4	x	0.4	x	0.7		42.64	(78)
South	0.9x	0.77	X	4.8	X		10.4	x	0.4	x	0.7	=	37.63	(78)
	_							•						
Solar g	ains in	watts, calcu	lated	for each mor	nth			(83)m	= Sum(74)m	(82)m				
(83)m=	98.38		1.48	244.82 259.8		252	245.41	234	.88 223.01	176.8	3 116.95	84.78		(83)
Ī				(84)m = (73)									Ī	
(84)m=	483.97	546.46 58	3.01	597.03 592.	6 5	65.95	547.11	542	.17 540.21	513.5	5 476.04	460.5		(84)
7. Mea	an inter	nal tempera	ture ((heating seas	on)									
Tempe	erature	during heat	ing pe	eriods in the	iving	area f	rom Tal	ble 9	Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gains	for li	ving area, h1	,m (s	ee Ta	ble 9a)					1		
	Jan	Feb M	Mar	Apr Ma	ay	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
Stroma F	SAD 201	2 Version: 1.0	5 51 /9	SAP 9 92) - http:	//\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	etroma	com						Page	5 of 7

	_	
(86)m= 0.99 0.99 0.97 0.93 0.84 0.65 0.48 0.5 0.73 0.93 0.99 1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.18 20.33 20.52 20.74 20.9 20.98 21 21 20.97 20.78 20.44 20.16		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 20.14 20.14 20.15 20.16 20.16 20.18 20.18 20.18 20.17 20.16 20.16 20.15		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.99 0.98 0.96 0.91 0.79 0.58 0.39 0.41 0.65 0.91 0.98 0.99		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 19.06 19.27 19.54 19.86 20.07 20.17 20.18 20.18 20.15 19.92 19.45 19.03		(90)
fLA = Living area ÷ (4) =	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_
(92)m= 19.52 19.7 19.94 20.21 20.41 20.5 20.51 20.51 20.48 20.27 19.85 19.49		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	' •	
(93)m= 19.52 19.7 19.94 20.21 20.41 20.5 20.51 20.51 20.48 20.27 19.85 19.49		(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-calc the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:	I	
(94)m= 0.99 0.98 0.96 0.91 0.81 0.61 0.42 0.45 0.68 0.91 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m	'	
(95)m= 479.68 536.39 560.58 544.81 477.3 344.35 232.38 243.23 368.39 467.11 466.47 457.34		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	1	
(97)m= 948.58 919.51 832.1 688.65 528.07 351.52 233.05 244.17 382.99 586.3 778.98 940.32		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 348.86 257.46 202.01 103.57 37.77 0 0 0 0 88.68 225 359.34	1	
Total per year (kWh/year) = $Sum(98)_{15912}$ =	1622.69	(98)
		╡
Space heating requirement in kWh/m²/year	24.22	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =		(302)
	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; to includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	he 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 heating system	1	」 (305)
Distribution loss factor (Table 12c) for community heating system](306)
	1.05	」 ` ′
Space heating Annual space heating requirement	kWh/year	٦
Annual Space heating requirement	1622.69	

Space heat from Community heat pump	(98) x (304a) x (305) x (3	306) =	1703.83	(307a)
Efficiency of secondary/supplementary heating system in % (1	rom Table 4a or Appendix E)		0] (308
Space heating requirement from secondary/supplementary sy	,) = [0	(309)
Water heating		L		_
Annual water heating requirement			1791.08	7
If DHW from community scheme:	(64) v (2020) v (205) v (,oe) [1000.00	
Water heat from Community heat pump	(64) x (303a) x (305) x (3	Ĺ	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310	a)(310e)] =	35.84	(313)
Cooling System Energy Efficiency Ratio		[0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =	L	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fro	m outside	[119.54	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330	g) =	119.54	(331)
Energy for lighting (calculated in Appendix L)			315.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (31	2) + (<mark>315) + (331) + (<mark>332)</mark>.(23</mark>	7b) =	3501.28	(338)
			_	
12b. CO2 Emissions – Community heating scheme				
12b. CO2 Emissions – Community heating scheme	0,	sion factor		
	kWh/year kg CC		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHF	kWh/year kg CC)2/kWh l	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CC 2) ing two fuels repeat (363) to (366) for)2/kWh l	kg CO <mark>2/yea</mark> r	(367a) (367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CC 2) ing two fuels repeat (363) to (366) for 2)+(310b)] x 100 ÷ (367b) x	2/kWh I	kg CO2/year	⊒ ` ¬
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)	kWh/year kg CC 2) ing two fuels repeat (363) to (366) for 2)+(310b)] x 100 ÷ (367b) x	the second fuel	256 726.69	(367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b) [(307b)	kWh/year kg CC ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x 0 [(313) x 0	the second fuel 52 = 52 =	256 726.69	(367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CC ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x	the second fuel 52 = 52 = = =	256 726.69 18.6 745.3	(367) (372) (373)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CC ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x	2/kWh the second fuel	256 726.69 18.6 745.3	(367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal	kWh/year kg CC) ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x neous heater (312) x (373) + (374) + (375) =	2/kWh the second fuel	256 726.69 18.6 745.3 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating	kWh/year kg CC) ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x neous heater (312) x (373) + (374) + (375) = elling (331)) x	the second fuel 52 = 52 = 0 = 22 =	256 726.69 18.6 745.3 0 745.3	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CC ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x neous heater (312) x (373) + (374) + (375) = elling (331)) x (332))) x	22/kWh the second fuel 52 = 52 = 0 = 22 =	256 726.69 18.6 745.3 0 745.3 62.04	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instanta Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applitem 1	kWh/year kg CC) ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x neous heater (312) x (373) + (374) + (375) = elling (331)) x (332))) x cable	2/kWh the second fuel 52 = 52 = 0 = 22 = 52 =	256 726.69 18.6 745.3 0 745.3 62.04 163.72	(367) (372) (373) (374) (375) (376) (378) (379) (380)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instanta Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwe CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applitem 1 Total CO2, kg/year sum of (376)(382) =	kWh/year kg CC) ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x neous heater (312) x (373) + (374) + (375) = elling (331)) x (332))) x cable	2/kWh the second fuel 52 = 52 = 0 = 22 = 52 =	256 726.69 18.6 745.3 0 745.3 62.04 163.72	(367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwell co2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1 Total CO2, kg/year sum of (376)(382) =	kWh/year kg CC) ing two fuels repeat (363) to (366) for)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x neous heater (312) x (373) + (374) + (375) = elling (331)) x (332))) x cable	2/kWh the second fuel 52 = 52 = 0 = 22 = 52 =	256 726.69 18.6 745.3 0 0 745.3 62.04 163.72 -268.93 702.13	(367) (372) (373) (374) (375) (376) (378) (379) (380) (383)

			User [Details:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	Sampl	e 3 (Bott	om)			
Address :										
Overall dwelling dimen	sions:		Δ	- (m- 2)		Av. Ha	! or lo 4 / soo \		\/ala/m	3)
Ground floor			Are	ea(m²) 67	(1a) x	Av. ne	ight(m)	(2a) =	Volume(m	3) (3a
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1r	1)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys		econdar eating	у П + Г	other 0	7 = 6	total 0	x	40 =	m³ per hou	.ır (6a
·]]			20 =		╡`
Number of open flues		0	」 ' L	0	」	0			0	(6b)
Number of intermittent fan	S				Ĺ	2		10 =	20	(7a)
Number of passive vents					L	0	X	10 =	0	(7b)
Number of flueless gas fire	es					0	X	40 =	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimneys	s. flues and fans = (6	a)+(6b)+(7	a)+(7b)+	(7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has be					continue f			. (-)	0.1	(-)
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2 if both types of wall are pre					•	ruction			0	(11
deducting areas of opening		portaing to	ine grea	ner wan are	a (anci					
If suspended wooden flo	oor, enter 0.2 (unseal	ed) or 0.	1 (seal	ed), 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) · ·	1001 -			0	(14
Window infiltration Infiltration rate				(8) + (10)	,	-	+ (15) =		0	(15
Air permeability value, q	150 expressed in cub	ic metre	s ner h					area	0	(16 (17
If based on air permeabilit	•			•	•	ictic oi c	лисюрс	arca	0.35	(17)
Air permeability value applies	=					is being u	sed		0.00	(
Number of sides sheltered	I								2	(19
Shelter factor				(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorporatir				(21) = (18) x (20) =				0.3	(21
Infiltration rate modified fo				1		1	1	1	1	
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan Feb M										
Monthly average wind spe	ed from Table 7	· · · · · ·						i	1	
Monthly average wind spe		3.8	3.8	3.7	4	4.3	4.5	4.7]	
Monthly average wind spe	ed from Table 7	3.8	3.8	3.7	4	4.3	4.5	4.7]	

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	Adjusted infiltr	ation rate	e (allowii	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
If exhancial ventilation: If exhancial ventilation: If exhancial ventilation: If exhancial ventilation with (23b) = (23a) × Fm/ (equation (NS)), otherwise (23b) = (23a) If exhancial ventilation with heat recovery, of the ventilation (NS) is a construction of the ventilation of the ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × (1 - (23a) + 100) [24a] If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × (1 - (23a) + 100) [24b] If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) × (1 - (23a) + 100) [24b] If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) [24b] If call house extract ventilation or positive input ventilation from outside if (22b)m × 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) [24c] If (22b)m × 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) [24c] If (22b)m × 0.5 × (23b), then (24c) = (23b); otherwise (24d)m = 0.5 + [(22b)m × 0.5] [24d] If (22b)m × 0.5 × (25b)			<u> </u>					<u> </u>	`	0.32	0.33	0.35		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a) \			_	ate for t	he appli	cable ca	se		!	!	!	!		
it balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =				ndiv N (2	2h) _ (22c) Em. (a	auation (N	IE\\ otho	nuico (22h) - (22a)				
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] 24ajm 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) = (23a)				(23b)
24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										21.) (001) [4 (00.)	_	(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·	 	-				<u> </u>		ŕ	, 	- 	<u>`</u>	÷ 100] I	(245)
24)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		<u> </u>					·					0		(24a)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· -	1 1	-						í `	r Ó T				(24h)
if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) 24e)m		<u> </u>		-							0	0		(240)
24cjm= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,				•	•				5 v (23h)			
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	<u> </u>	1 1	` 		<u> </u>		· ·	<u> </u>	ŕ –	· ` ·		0		(24c)
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] 24d)m = 0.57	(1)	l	n or who	ole hous	e nositiv	/e innut	ventilatio	n from l	oft.					` '
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 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 0.56 (25) 3. Heat losses and heat loss parameter ELEMENT Gross area (m²)	,					•				0.5]				
26)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 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	(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)
3. Heat osses and heat loss parameter. ELEMENT Gross area (m²) Openings	Effective air	change r	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				•	
A X U	(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)
A X U	3 Hoat losse	e and has	at lose n	aramot	or.									_
A ,m² W/m2K (W/K) kJ/m²-K kJ/K (26) 2.4						Net Ar	ea	U-valı	IE	AXII		k-value	2	AXk
Nindows Type 1											K)			
Vindows Type 2 S.44 x1/[1/(1.4) + 0.04] T.21 (27)	Doors					2.4	x	1	=	2.4				(26)
Alsa x1/[1/(1.4) + 0.04] = 6.36 (27)	Windows Type	e 1	7			1.44	x1/	/[1/(1.4)+	0.04] =	1.91	П			(27)
Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Comp	Windows Type	e 2				5.44	x1/	/[1/(1.4)+	0.04] =	7.21	П			(27)
Valls Type1 31.65 10.24 21.41 x 0.18 = 3.85 (29)	Windows Type	e 3				4.8	x1/	/[1/(1.4)+	0.04] =	6.36	5			(27)
Walls Type2 2.3 1.44 0.86 x 0.18 = 0.15 (29) Walls Type3 11.1 2.4 8.7 x 0.18 = 1.57 (29) Walls Type4 2.4 0 2.4 x 0.18 = 0.43 (29) Total area of elements, m² 114.45 (31) (31) (32) (31) (32) (32) (32) (32) (33) (34) (34) (34) (34) (34) (34) (35) (35) (36) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (37) (38) (37) (38) (37) (36) (37) (37) (38) (37) (38) (37) (38) (38) (37) (37) (38) (38) (37) (37) (38) (38) (38) (38) (38) (38) (37) (37) (38) (38) (39) (39) (39) (39) <td< td=""><td>Floor</td><td></td><td></td><td></td><td></td><td>67</td><td>x</td><td>0.13</td><td></td><td>8.71</td><td>= [</td><td></td><td></td><td>(28)</td></td<>	Floor					67	x	0.13		8.71	= [(28)
Walls Type2 2.3 1.44 0.86 x 0.18 = 0.15 (29) Walls Type3 11.1 2.4 8.7 x 0.18 = 1.57 (29) Walls Type4 2.4 0 2.4 x 0.18 = 0.43 (29) Total area of elements, m² 114.45 (31) (31) (32) (31) (32) (32) (32) (32) (33) (34) (34) (34) (34) (34) (34) (35) (35) (36) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (36) (37) (37) (38) (37) (38) (37) (36) (37) (37) (38) (37) (38) (37) (38) (38) (37) (37) (38) (38) (37) (37) (38) (38) (38) (38) (38) (38) (37) (37) (38) (38) (39) (39) (39) (39) <td< td=""><td>Walls Type1</td><td>31.65</td><td>5</td><td>10.24</td><td>4</td><td>21.41</td><td>X</td><td>0.18</td><td>= </td><td>3.85</td><td>F i</td><td></td><td>-</td><td>(29)</td></td<>	Walls Type1	31.65	5	10.24	4	21.41	X	0.18	=	3.85	F i		-	(29)
Walls Type3 11.1 2.4 8.7 X 0.18 1.57 (29) Walls Type4 2.4 0 2.4 X 0.18 1.57 (29) Total area of elements, m² 114.45 (31) If or windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28) (29) (31) (31) (32) (33) (48) (48) (10) (10) (10) (10) (11) (11) (12) (13) (13) (14) (14) (15) (16) (17) (17) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18) (18)	Walls Type2				=		=		=		=		i i	
Valls Type4 2.4 0 2.4 x 0.18 = 0.43 (29) Total area of elements, m² 114.45 (31) If or windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5492.18 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the same be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (34) (35) (36) (37) (38) (39) + (36) = (38) (38) + (36) = (38) (38) + (36) = (38)							=		-		=		╡┝	
Total area of elements, m ² 114.45 (31) If or windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (38) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f then be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (38)m = 0.33 × (25)m × (5)	•				=		=		_		룩 ;		╡ ⊨	
for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions **Fabric heat loss, W/K = S (A x U) **Heat capacity Cm = S(A x k) **Intermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K **Indicative Value: Medium **Intermal bridges : S (L x Y) calculated using Appendix K **Intermal bridges : S (L x Y) calculated using Appendix K **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31) **Intermal bridging are not known (36) = 0.05 x (31)		L	 m²				=	0.10		0.40				
* include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (32.6 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5492.18 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K f details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (34) (35) (35) (36)		•		ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragraph	3.2	(01)
Heat capacity $Cm = S(A \times K)$. (,	J	, .		
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.72 (36) If details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = 38.32 (37) Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m × (5)	Fabric heat lo	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				32.6	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K f details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 38.32 (37) Ventilation heat loss calculated monthly	Heat capacity	Cm = S(A)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5492.	18 (34)
Finance and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly If otal fabric heat loss calculated monthly	Thermal mass	paramet	er (TMF	' = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
f details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = 38.32 (37) (4) (4) (5) (38) m = $0.33 \times (25)$ m × (5)	ŭ				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Total fabric heat loss $ (33) + (36) = $ $ /entilation heat loss calculated monthly (38)m = 0.33 \times (25)m \times (5) $	Thermal bridg	es : S (L :	x Y) cald	culated (using Ap	pendix ł	<						5.72	(36)
/entilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5)			are not kno	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			38.3	2 (37)
			lculated	monthly	/						25)m x (5))	33.0.	` ′
I JOHN I TEN I IVION I ANN I IVION I JUNI I JUNI I JUNI I JEN I JUNI I IVOV I DECI	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 37.92 37.74 37.56 36.71 36.55 35.81 35.81 35.67 36.09 36.55 36.87 37.21	(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
(39)m= 76.25 76.06 75.88 75.03 74.87 74.13 74.13 73.99 74.42 74.87 75.19 75.53	(20)
Average = Sum(39) ₁₁₂ /12= 75.03 Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)	(39)
(40)m= 1.14 1.13 1.12 1.11 1.11 1.11 1.11 1.11 1.12 1.13	
Average = $Sum(40)_{112}/12=$ Number of days in month (Table 1a)	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.17	(42)
Assumed occupancy, N = $1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	
(44)m= 94.34 90.91 87.48 84.05 80.62 77.19 77.19 80.62 84.05 87.48 90.91 94.34	
Total = Sum(44) ₁₁₂ = 1029.	18 (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= 139.91 122.36 126.27 110.08 105.63 91.15 84.46 96.92 98.08 114.3 124.77 135.49	
Total = $Sum(45)_{112}$ = 1349. If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)
	(46)
(46)m= 20.99 18.35 18.94 16.51 15.84 13.67 12.67 14.54 14.71 17.15 18.72 20.32 Water storage loss:	(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year (48) × (49) = 0.75	(50)
b) If manufacturer's declared cylinder loss factor is not known:	(00)
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52) (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(54)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	· ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 23.33 23.33 22.58 23.33	(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated f	or each month (59)m = (58) ÷ 365 × (41)	m				•	
(modified by factor from Tabl	e H5 if there is s	olar water	heating and a	cylinder	r thermo	stat)		•	
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 2	3.26 23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365	× (41)m						
(61)m= 0 0 0	0 0	0	0 0	0	0	0	0		(61)
Total heat required for water he	eating calculated	for each m	nonth (62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 186.5 164.45 172.86	155.17 152.22	136.24 13	31.06 143.52	143.17	160.9	169.86	182.09		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative o	quantity) (enter '0	' if no solar	r contribut	ion to wate	r heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, se	ee Appendix (€)					
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0 0	0	0	0	0		(63) (G2
Output from water heater									
(64)m= 186.5 164.45 172.86	155.17 152.22	136.24 13	31.06 143.52	143.17	160.9	169.86	182.09		
		-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat gains from water heating,	kWh/month 0.25	5 ´[0.85 × ((45)m + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m= 83.79 74.35 79.26	72.68 72.4	66.38 6	5.36 69.5	68.68	75.28	77.56	82.33		(65)
include (57)m in calculation of	of (65)m only if c	<mark>ylin</mark> der is in	the dwelling	or hot wa	ater is fr	om com	munity h	eating	
5. Internal gains (see Table 5	and 5a):								
Metabolic gains (Table 5), Wat	ts								
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56	08.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	pendix L, equati	on L9 or L9	9a), also see	Table 5					
(67)m= 17.41 15.46 12.58	9.52 7.12	6.01	6.49 8.44	11.33	14.38	16.79	17.89		(67)
Appliances gains (calculated in	Appendix L, eq	uation L13	or L13a), also	see Tal	ole 5			•	
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 14	42.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	opendix L, equat	ion L15 or	L15a), also se	ee Table	5			•	
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 3	3.86 33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	<u>. </u>	•	•			•		•	
(70)m= 3 3 3	3 3	3	3 3	3	3	3	3		(70)
Losses e.g. evaporation (negat	tive values) (Tab	le 5)	•					•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -8	36.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)	•	•	•					•	
(72)m= 112.63 110.65 106.53	100.94 97.31	92.19 8	7.85 93.42	95.4	101.18	107.72	110.65		(72)
Total internal gains =		(66)m +	+ (67)m + (68)m +	+ (69)m + (70)m + (7	1)m + (72)	m		
(73)m= 378.8 376.85 364.87	345.64 326.23	307.45 2	95.2 300.74	310.58	330.01	352.32	368.92		(73)
6. Solar gains:									
Solar gains are calculated using solar	r flux from Table 6a a	and associate	d equations to co	onvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux	0	g_ 	_	FF		Gains	
Table 6d	m²	Table	ьа Т 	able 6b	_ T	able 6c		(W)	_
East 0.9x 0.77 x	1.44	x 19.6	4 X	0.63	x	0.7	=	8.64	(76)

East	0.9x	0.77	X	1.44	X	38.42	×	0.63	x	0.7	=	16.91	(76)
East	0.9x	0.77	x	1.44	x	63.27	X	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77	x	1.44	х	92.28	X	0.63	х	0.7	=	40.61	(76)
East	0.9x	0.77	×	1.44	x	113.09	X	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	×	1.44	x	115.77	X	0.63	x	0.7	<u> </u>	50.95	(76)
East	0.9x	0.77	×	1.44	x	110.22	X	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	×	1.44	x	94.68	X	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	×	1.44	x	73.59	X	0.63	x	0.7	<u> </u>	32.39	(76)
East	0.9x	0.77	×	1.44	x	45.59	X	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	×	1.44	x	24.49	X	0.63	x	0.7	=	10.78	(76)
East	0.9x	0.77	×	1.44	x	16.15	X	0.63	x	0.7	<u> </u>	7.11	(76)
South	0.9x	0.77	×	5.44	x	46.75	X	0.63	x	0.7	=	77.73	(78)
South	0.9x	0.77	×	4.8	x	46.75	X	0.63	x [0.7	=	68.58	(78)
South	0.9x	0.77	×	5.44	x	76.57	T x	0.63	x	0.7	=	127.3	(78)
South	0.9x	0.77	×	4.8	x	76.57	i x	0.63	x	0.7	=	112.32	(78)
South	0.9x	0.77	×	5.44	j x	97.53	Īx	0.63	x [0.7	=	162.15	(78)
South	0.9x	0.77	×	4.8	x	97.53	Īx	0.63	×	0.7	=	143.08	(78)
South	0.9x	0.77	x	5.44	X	110.23	Х	0.63	Х	0.7	=	183.27	(78)
South	0.9x	0.77	×	4.8	x	110.23	x	0.63	x	0.7		161.71	(78)
South	0.9x	0.77	×	5.44	x	114.87	i 📈	0.63	x	0.7	=	190.98	(78)
South	0.9x	0.77	×	4.8	X	114.87	1 /x	0.63	×	0.7	=	168.51	(78)
South	0.9x	0.77	×	5.44	x	110.55	X	0.63	×	0.7	_	183.79	(78)
South	0.9x	0.77	٦ ×	4.8	x	110.55	X	0.63	x	0.7		162.17	(78)
South	0.9x	0.77	× ا	5.44	x	108.01	i x	0.63	×	0.7		179.57	(78)
South	0.9x	0.77	T x	4.8	x	108.01	j x	0.63	×	0.7	-	158.45	(78)
South	0.9x	0.77	×	5.44	x	104.89	i x	0.63	×	0.7	=	174.39	(78)
South	0.9x	0.77	×	4.8	X	104.89	j ×	0.63	×	0.7	=	153.87	(78)
South	0.9x	0.77	×	5.44	j×	101.89	j ×	0.63	x	0.7	-	169.39	(78)
South	0.9x	0.77	×	4.8	x	101.89	j x	0.63		0.7	=	149.46	(78)
South	0.9x	0.77	×	5.44	x	82.59	j ×	0.63		0.7		137.3	(78)
South	0.9x	0.77	×	4.8	j x	82.59	j ×	0.63	x	0.7	_ =	121.15	(78)
South	0.9x	0.77	×	5.44	x	55.42	X	0.63	x	0.7	=	92.13	(78)
South	0.9x	0.77	×	4.8	x	55.42	i x	0.63	x	0.7		81.29	(78)
South	0.9x	0.77	×	5.44	X	40.4	x	0.63	x	0.7	=	67.16	(78)
South	0.9x	0.77	×	4.8	x	40.4	X	0.63	x [0.7	=	59.26	(78)
	L				_		_						
Solar ga	ains in	watts, calcu	ulated	for each mon	ıth		(83)m	n = Sum(74)m	(82)m				
(83)m=	154.95	256.53 33	33.08	385.59 409.2	6 3	96.91 386.53	369	.93 351.23	278.51	184.2	133.53		(83)
Total ga	ains – i	nternal and	solar	(84)m = (73) r	n + (83)m , watts				_			
(84)m=	533.75	633.37 69	97.95	731.22 735.4	9 7	04.36 681.72	670	.67 661.81	608.52	536.52	502.45		(84)
7. Mea	an inter	nal tempera	ature (heating seas	on)								
Tempe	erature	during hea	ting pe	eriods in the I	iving	area from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gain	s for li	ving area, h1	,m (s	ee Table 9a)							
	Jan	Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
Stroma F	 SAP 201	2 Version: 1 0	5 51 (9	SAP 9 92) - http:/	//\^\^\	stroma com		· · · ·				Page	5 of 7

Mean internal temperature in whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 15 15 15 14 1971 20.4 20.7 20.38 20.4 20.4 20.6 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 2															
Section 19.95 20.15 20.4 20.66 20.86 20.97 20.98 20.99 20.94 20.80 20.27 19.92 19.92 19.92 19.92 19.92 19.92 19.93 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.95 19.	(86)m=	0.99	0.98	0.96	0.91	0.81	0.64	0.47	0.5	0.72	0.92	0.98	0.99		(86)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C)	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
Company 19.97 19.97 19.97 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19.98 19	(87)m=	19.96	20.15	20.4	20.66	20.86	20.97	20.99	20.99	20.94	20.69	20.27	19.92		(87)
Wellistation factor for gains for rest of dwelling, h2 m (see Table 9a)	Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m	(88)m=	19.97	19.97	19.97	19.98	19.99	20	20	20	19.99	19.99	19.98	19.98		(88)
Mean intermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
Solution 18.6 18.89 13.23 19.6 19.86 19.88 19.98 19.99 19.95 19.66 19.07 18.55 (9)	(89)m=	0.99	0.98	0.95	0.89	0.76	0.55	0.37	0.39	0.63	0.89	0.98	0.99		(89)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)mm 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.38 20.08 19.56 19.11 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)mm 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93) (93	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	e 9c)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (92)	(90)m=	18.6	18.89	19.23	19.6	19.86	19.98	19.99	19.99	19.95	19.66	19.07	18.55		(90)
19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (92)										f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (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 0.99 0.97 0.95 0.88 0.78 0.59 0.41 0.44 0.67 0.89 0.97 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m 527.45 616.68 660.14 648.81 570.04 415.14 280.11 289.69 440.29 544.15 522.89 497.9 Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 9.9 11.7 146 16 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W = (39)m x [(39)m - (95)m] x (41)m (98)m 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 Space heating requirements Individual heating systems including micro-CHP) Space heating requirements Individual heating systems including micro-CHP Space heating requirement from main system 1 (204) = (202) x [1 - (203)] = 1 - (201) = 1 (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] = 1 (204) (202) x [1 - (203)] =	Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
Sepace heating requirement 19.15 19.4 19.71 20.04 20.27 20.38 20.4 20.4 20.36 20.08 19.56 19.11 (93)	(92)m=	19.15	19.4	19.71	20.04	20.27	20.38	20.4	20.4	20.36	20.08	19.56	19.11		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m - 0.99	Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: [94]m= 0.99 0.97 0.95 0.89 0.78 0.59 0.78 0.59 0.41 0.44 0.67 0.89 0.97 0.99 Useful gains, hmGm . W = (94)m x (84)m (95)m = 527.45 616.88 560.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 146.6 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) 1 (97)m = 1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 336.7 1125.95 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 450.1 326.88 254.48 134.4 53.1 0 0 0 0 1 23.1 297.94 467.27 Total per year (kWh/year) = Sum(98). 56.7 e 2107.29 (98) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (204) = (202) x [1 - (201)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = 1 (204) = (202) x [1 - (203)] = (202) = (202) x [1 - (203)] = (202) = (202) x [1 - (203)] = (202) = (202) x [1 - (203)] = (202) = (202) x [1 - (203)] = (202) = (. ,					20.27	20.38	20.4	20.4	20.36	20.08	19.56	19.11		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							- 1 -1 -1	44 . (T-1.1- 01	41 -	(T' /:	70)		l	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec							ed at ste	ep 11 of	able 9	o, so tha	t II,m=(/6)m an	d re-calc	ulate	
(94) (94) (94) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (95) (9				Ň			Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm, W = (94)m x (84)m (95)m = 527.45 616.68 660.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 (95)	Util <mark>is</mark> a	ation fac	tor for g	ains, hm	:										
(95)me 527.45 616.68 660.14 648.81 570.04 415.14 280.11 293.69 440.29 544.15 522.89 497.9 Monthly average external temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)me 1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)sz = 2107.29 (98) Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) x [1 - (203)] = 1 (204) (204) (202) x [1 - (203)] = 1 (204) (204) (202) x [1 - (203)] = 1 (204) (204) (208) Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)]} x 100 ÷ (206) (211)	(94)m=	0.99	0.97	0.95	0.89	0.78	0.59	0.41	0.44	0.67	0.89	0.97	0.99		(94)
Monthly average external temperature from Table 8 (96) m = 4.3	Usefu			<u> </u>	<u> </u>										
(96) 1.	` '							280.11	293.69	440.29	544.15	522.89	497.9		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m = (1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m = (450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)sa2 = (2107.29 (98) Space heating requirement in kWh/m²/year 31.45 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) =								40.0	40.4	444	10.0	7.4	4.0		(06)
(97) m= 1132.43 1103.12 1002.19 835.48 641.41 428.52 281.81 296.07 465.61 709.61 936.7 1125.95 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98)ssv = 2107.29 (98) Space heating requirement in kWh/m²/year 31.45 (99) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heating from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211) (211)							l					7.1	4.2		(90)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 Total per year (kWh/year) = Sum(98) ₁₋₂₈₋₁₂ = 2107.29 (98) Space heating requirement in kWh/m²/year				1	·		r	-`` /-				936.7	1125.95		(97)
Space heating requirement in kWh/m²/year State Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system O (201)	. ,			<u> </u>		nonth, k		<u> </u>	<u> </u>			<u> </u>			
Space heating requirement in kWh/m²/year 31.45 (99)	•		 					1		``		 	467.27		
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) × [1 - (203)] = 1 (204) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 0 131.66 318.65 499.75									Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2107.29	(98)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) (211)	Spac	e heatin	g require	ement in	kWh/m²	/year								31.45	(99)
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Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75								3		,					
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75	Fract	ion of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75	Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	Fract	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 450.1 326.88 254.48 134.4 53.1 0 0 0 123.1 297.94 467.27 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 481.39 349.61 272.17 143.75 56.79 0 0 0 131.66 318.65 499.75	Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above)	Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	າ, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	— /ear
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (212) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (213) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (214) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (215) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (216) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (217) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (218) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 $ $ (219) m = \{ [(98) m \times (204)] \} \times 100 $ $ ($	Spac	e heatin	g require	ement (c	alculate	d above)								
481.39 349.61 272.17 143.75 56.79 0 0 0 0 131.66 318.65 499.75		450.1	326.88	254.48	134.4	53.1	0	0	0	0	123.1	297.94	467.27		
	(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
Total (kWh/year) = Sum(211) _{1.5,10.112} = 2253.78 (211)		481.39	349.61	272.17	143.75	56.79	0	0		_					
									Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2253.78	(211)

215)m= 0 0 0 0 0	0 0	0 0	0	0	0		
		Total (kWh/y	rear) =Sum(2	215) _{15,1012}	=	0	(21
Nater heating					L		_
Output from water heater (calculated above)			7 100 0	400.00	100.00		
186.5	36.24 131.06	143.52 143.1	7 160.9	169.86	182.09	70.0	(210
· · · · · · · · · · · · · · · · · · ·	79.8 79.8	79.8 79.8	84.11	86.3	87.22	79.8	ارکار 21:)
Fuel for water heating, kWh/month	70.0	70.0		00.0	01.22		(
219)m = (64)m x 100 ÷ (217)m				ī	1		
219)m= 214.17 189.87 201.37 183.78 184.92 1	70.73 164.23	179.84 179.4		196.83	208.76		_
		Total = Sum				2265.21	(219
Annual totals Space heating fuel used, main system 1			K	Wh/year	r [kWh/year 2253.78	7
Nater heating fuel used					<u> </u>	2265.21	╡
Electricity for pumps, fans and electric keep-hot					Ţ	2203.21	
							(00
central heating pump:					30		(23
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year		sum of (230	a)(230g) =			75	(23
Electricity for lighting						307.48	(23
Fotal delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =				4901.47	(33
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP					
	Energy		Emiss	ion fac	tor	Emissions	
			kg CO			kg CO2/yea	ar
	kWh/year		U				_
Space heating (main system 1)	(211) x		0.2	16	=	486.82	(26
Space heating (main system 1) Space heating (secondary)	•				= [= [486.82	(26 (26
Space heating (secondary)	(211) x		0.2	19	L		(26
Space heating (secondary) Vater heating	(211) x (215) x (219) x	+ (263) + (264) =	0.2	19	= [0	_
	(211) x (215) x (219) x	+ (263) + (264) =	0.2	19	= [0 489.29	(26 (26
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262)	+ (263) + (264) =	0.2	19 16 19	= [0 489.29 976.1	[] (26] (26] (26

TER =

(273)

17.53

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Flat Dwelling type:

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 67 m² 3 m

Floor 0

27.3 m² (fraction 0.407) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame
DOO	R	<u>Manuf</u> actur <mark>er</mark>	Solid			Wood
W		Manufacturer	Windows	low-E, $En = 0.05$, soft coat No	
S		Manufacturer	Windows	low-E, En = 0.05	, soft coat No	
Balco	ony	Manufactur <mark>e</mark> r	Windows	low-E, $En = 0.05$, <mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
W		W	West	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen	<u>ts</u>						
S	31.7	10.24	21.46	0.15	0	False	N/A
W	19	1.44	17.56	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	67			0.11			N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

			User [Details:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa				Versio	on: 1.0.5.51	
		Pr	operty	Address	Sample	e 4 (Bott	om)			
Address :										
1. Overall dwelling dimer	nsions:		A	- (2\		A., 11a	! au la 4 (au a)		Value of m	2)
Ground floor			Are	a(m²) 67	(1a) x	Av. ne	ight(m)	(2a) =	Volume(m	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	67	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:										
Number of chimneys	heating h	econdary neating	у 7 + Г	other	7 ₌ F	total		40 =	m³ per hou	_
ŕ		0	╛╘	0	<u> </u>	0		20 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0			0	(6b)
Number of intermittent far	าร					0	X	10 =	0	(7a)
Number of passive vents						0	Х	10 =	0	(7b)
Number of flueless gas fir	res					0	X ·	40 =	0	(7c)
								Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimney	s, flues and fans = (6	a)+(6b)+(7a	a)+(7b)+((7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be	een carried out or is intende	ed, proceed	I to (17),	otherwise o	ontinue fi	rom (9) to	(16)			
Number of storeys in th	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration Structural infiltration: 0.	25 for stool or timber	frome or	0.25 fo	r macan	v const	ruotion	[(9)	-1]x0.1 =	0	(10
if both types of wall are pro					•	ruction			0	(11
deducting areas of opening	gs); if equal user 0.35	-								_
If suspended wooden fl	,	led) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent		trinnad							0	(13
Percentage of windows Window infiltration	and doors draught s	прреа		0.25 - [0.2	x (14) ÷ 1	1001 =			0	(14 (15
Infiltration rate				(8) + (10)	` '		+ (15) =		0	(13
Air permeability value,	g50, expressed in cub	oic metres	s per ho					area	3	(17
If based on air permeabili	•		•	•	•				0.15	 (18
Air permeability value applies	s if a pressurisation test ha	s been don	e or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	d			(00) 4	0 07F ·· (40)1			2	(19
Shelter factor	Consideration to stan			(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorporati				(21) = (18)	(20) =				0.13	(21)
Infiltration rate modified fo		 	Jul	Λιια	Son	Oct	Nov	Doo	1	
	Mar Apr May	Jun	Jui	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind specification (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)11- 3.1	7.0 7.7 4.0] 3.0	5.0	J 3.7	7	1 4.3	1 4.5	L'	J	
Wind Factor (22a)m = (22	2)m ÷ 4								_	

	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
alcul ate effe d		-	ate for t	he appli	cable ca	se					<u> </u>	<u> </u>	
If mechanica	al ventilati	on:										0.5	(2
If exhaust air he		0		, ,	, ,	. `	,, .	,) = (23a)			0.5	(2
If balanced with	heat recov	ery: effici	ency in %	allowing f	or in-use fa	actor (from	n Table 4h) =				79.05	(2
a) If balance						<u> </u>		<u> </u>	2b)m + (2	23b) × [′	· ` ´	÷ 100]	
4a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
b) If balance						- `	- ^ `	<u> </u>	<u> </u>	•	ı	1	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole he if (22b)m	ouse extr $1 < 0.5 \times 0$			-	-				5 × (23b)		_	
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural vif (22b)m	ventilatior n = 1, ther			•	•				0.5]				
ld)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change ra	ate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				-	
i)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
. Heat losses	s and hea	t loss r	paramete	ir.								_	
EMENT	Gross area (ı	3	Openin m	gs	Net Ard A ,n		U-valı W/m2		A X U (W/k	()	k-value kJ/m²-l		A X k kJ/K
oo <mark>rs</mark>					2.4	x	1.4	= [3.36				(2
n <mark>dows</mark> Type	: 1				1.44	x	1/[1/(1)+ (0.04] =	1.38	Ħ			(:
ndows Type	2	,			5.44	元 /x ·	1/[1/(1)+ (0.04] =	5.23	Ħ			(2
ndows Type	3				4.8	— x ·	1/[1/(1)+ (0.04] =	4.62	5			(:
oor					67	X	0.11	─	7.37				(2
	04.7	\neg	10.24	1	21.46	x	0.15	-	3.22	=			
alls Type1	I 31./									룩 ;		-	_
	31.7	=	1.44		17.56	x	0.15	=	2.63				10
alls Type1 alls Type2 alls Type3	19		1.44		17.56	=	0.15	= [= [2.63				_
alls Type2	19		2.4		8.7	x	0.15	= [1.3				
alls Type2 alls Type3 alls Type4	19 11.1 2.4	m²			8.7 2.4	x x		=					(
alls Type2	19 11.1 2.4 Ilements,	ws, use e	2.4 0	ndow U-va	8.7 2.4 131.2	x x	0.15	= [1.3	s given in	paragraph	3.2	(1
alls Type2 alls Type3 alls Type4 tal area of e or windows and nclude the area	19 11.1 2.4 Ilements, a roof window as on both sa	ws, use e ides of in	2.4 0	ndow U-va	8.7 2.4 131.2	x x	0.15	= [= [/[(1/U-valu	1.3	s given in	paragraph	3.2	(:
alls Type2 alls Type3 alls Type4 tal area of e or windows and nclude the area bric heat los	19 11.1 2.4 lements, roof window as on both si ss, W/K =	ws, use e ides of in S (A x	2.4 0	ndow U-va	8.7 2.4 131.2	x x	0.15 0.35	= [= [/[(1/U-valu + (32) =	1.3				(;
alls Type2 alls Type3 alls Type4 tal area of e	19 11.1 2.4 Ilements, roof window as on both si ss, W/K = Cm = S(A	ws, use e ides of in S (A x A x k)	2.4 0 ffective winternal wall U)	ndow U-va	8.7 2.4 131.2 alue calculatitions	x x x ated using	0.15 0.35	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as	?) + (32a).		29.96	(;
alls Type2 alls Type3 alls Type4 tal area of e or windows and include the area bric heat lose eat capacity of ermal mass or design assess	19 11.1 2.4 Ilements, roof window as on both si as, W/K = Cm = S(A paramete	ws, use e ides of in S (A x A x k) er (TMF re the dea	2.4 0 ffective winternal wall U) P = Cm ÷	ndow U-va s and pan	8.7 2.4 131.2 alue calculatitions	x x ated using	0.15 0.35 of formula 1.	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as .(30) + (32)	?) + (32a). Medium	(32e) =	29.96 5726.68	
alls Type2 alls Type3 alls Type4 tal area of e or windows and include the area bric heat lose eat capacity (19 11.1 2.4 Ilements, I roof window as on both si as, W/K = Cm = S(A paramete sments when ad of a deta	ws, use e ides of in S (A x A x k) er (TMF re the den	2.4 0 ffective winternal wall U) P = Cm ÷ tails of the ulation.	ndow U-ve s and pan - TFA) ir construct	8.7 2.4 131.2 alue calculations kJ/m²K fron are not	x x ated using	0.15 0.35 of formula 1.	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as .(30) + (32)	?) + (32a). Medium	(32e) =	29.96 5726.68	(:
alls Type2 alls Type3 alls Type4 tal area of e or windows and include the area bric heat los eat capacity (ermal mass or design assess in be used instea	19 11.1 2.4 Ilements, I roof window as on both si as, W/K = Cm = S(A paramete sments when ad of a deta es : S (L x al bridging a	ws, use e ides of in S (A x A x k) er (TMF re the det ided calcu x Y) calc	2.4 0 ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and pand	8.7 2.4 131.2 alue calculations kJ/m²K fon are not spendix k	x x ated using	0.15 0.35 of formula 1.	= [= [/[(1/U-valu + (32) = ((28)	1.3 0.84 e)+0.04] as .(30) + (32 tive Value: values of	?) + (32a). Medium	(32e) =	29.96 5726.68 250	

								1			I	(2.5)
` '	52 17.31		16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer coeff	 _		1	T	T	T	- ` 	= (37) + (T	I	
(39)m= 67.37 67	16 66.94	65.89	65.68	64.62	64.62	64.41	65.04	65.68	66.1	66.52	65.02	(39)
Heat loss paramet	er (HLP), \	N/m²K						= (39)m ÷	Sum(39) ₁ - (4)	12 / 1 Z=	65.83	(39)
(40)m= 1.01	1	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.99	0.99		_
Number of days in	month (Ta	able 1a)					,	Average =	Sum(40)₁	12 /12=	0.98	(40)
	eb Mai	<u> </u>	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	8 31	30	31	30	31	31	30	31	30	31		(41)
L .	!		•				l				J	
4. Water heating	energy rec	uirement:								kWh/ye	ear:	
Assumed secures	ov. N										ı	(40)
Assumed occupar if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76	x [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.17		(42)
Annual average h		age in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		85	5.76	1	(43)
Reduce the annual ave	rage hot wat	er usage by	5% if the c	lwelling is	designed			se target o			1	, ,
not more that 125 litres		7 1			<u>, </u>			0 1				
Jan F Hot water usage in litre	eb Mai		May	Jun	Jul Table 1c x	(43)	Sep	Oct	Nov	Dec		
(44)m= 94.34 90			80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
(44)111= 34.34 30	51 07.40	04.00	00.02	77.15	17.15	00.02			m(44) ₁₁₂ :		1029.18	(44)
Energy content of hot w	vater used - d	ca <mark>lculate</mark> d m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			` '			` ′
(45)m= 139.91 122	.36 126.2	7 110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If instantaneous water	hooting of no	int of upo (n	o hot wata	r otorogo)	ontor O in	hoves (46		Total = Su	m(45) ₁₁₂ :	=	1349.41	(45)
			1		1	· ·	. , ,	47.45	10.70	00.00	1	(46)
(46)m= 20.99 18 Water storage loss	35 18.94 :	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volume (li	res) includ	ding any s	olar or V	WHRS	storage	within sa	ame ves	sel		0		(47)
If community heati	ng and no	tank in dv	velling, e	enter 110) litres in	(47)					1	
Otherwise if no sto		ater (this i	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water storage loss a) If manufacturer		d loss fact	or is kno	wn (kWł	n/day).					0		(48)
Temperature factor			000	(., a.a.y / .					0		(49)
Energy lost from w			ear			(48) x (49)) =			10		(50)
b) If manufacturer	's declared	d cylinder	loss fact									, ,
Hot water storage			le 2 (kW	h/litre/da	ay)				0	.02		(51)
If community heati Volume factor fron	•	JUON 4.3							1	.03		(52)
Temperature factor		le 2b							-).6		(53)
Energy lost from w	ater storaç	ge, kWh/y	ear			(47) x (51)) x (52) x (53) =	1	.03		(54)
Enter (50) or (54)	in (55)								1	.03		(55)
Water storage loss	calculated	d for each	month			((56)m = (55) × (41)	m				
` '	92 32.01		32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dec	icated solar s	storage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	60), else (5	7)m = (56)	m where (H11) is fro	om Append	ix H	
(57)m= 32.01 28	92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from	m Table 3							0		(58)		
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m												
(modified by factor from Table	e H5 if there is s	olar wat	er heatir	ng and a	cylinde	r thermo	ostat)					
(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 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		(61)		
Total heat required for water he	(59)m + (61)m											
(62)m= 195.18 172.29 181.54	163.58 160.9	144.64	139.74	152.2	151.57	169.58	178.26	190.77		(62)		
Solar DHW input calculated using Appe	endix G or Appendix	H (negativ	ve quantity	/) (enter '0	if no sola	r contribu	tion to wate	r heating)	•			
(add additional lines if FGHRS a	and/or WWHRS	applies,	, see Ap	pendix (∋)							
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0		(63)		
FHRS 18.03 16.04 16.49	14.58 14.03	12.18	11.28	12.94	13.08	15.09	16.32	17.54		(63) (G2		
Output from water heater												
(64)m= 174.47 153.83 162.37	146.4 144.19	129.86	125.78	136.58	135.89	151.81	159.35	170.55		_		
				Outp	out from wa	ater heate	r (annual)	12	1791.08	(64)		
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]			
(65)m= 90.74 80.63 86.21	79.4 79.34	73.1	72.31	76.45	75.41	82.23	84.28	89.27		(65)		
include (57)m in calculation o	of (65)m only if c	ylinder is	s in the	dwelling	or hot w	ate <mark>r is f</mark>	rom com	munity h	eating			
5. Internal gains (see Table 5	and 5a):											
Metabolic gains (Table 5), Watts	S											
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)		
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or	L9a), a	lso see	Table 5							
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16	6.66	8.66	11.62	14.75	17.22	18.36		(67)		
Appliances gains (calculated in	Appendix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			•			
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)		
Cooking gains (calculated in Ap	pendix L, equat	ion L15	or L15a)	, also se	e Table	5			•			
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)		
Pumps and fans gains (Table 5	a)						•		•			
(70)m= 0 0 0	0 0	0	0	0	0	0	0	0		(70)		
Losses e.g. evaporation (negati	ive values) (Tab	le 5)										
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)		
Water heating gains (Table 5)	•								•			
(72)m= 121.96 119.98 115.87	110.27 106.64	101.53	97.18	102.75	104.73	110.52	117.06	119.99		(72)		
Total internal gains =	'	(66)	m + (67)m	ı + (68)m -	+ (69)m + ((70)m + (7	'1)m + (72)	m	ı			
(73)m= 385.59 383.58 371.53	352.22 332.75	313.94	301.7	307.29	317.21	336.72	359.09	375.72		(73)		
6. Solar gains:												
Solar gains are calculated using solar	flux from Table 6a	and associ	ated equa	tions to co	nvert to th	e applica	ole orientat	ion.				
Orientation: Access Factor	Area				g_ -				Gains			
Table 6d	m²	Tab _	ole 6a	Table 6b			Table 6c		(W)	_		
South 0.9x 0.77 x	5.44	x 4	6.75	X	0.4	x	0.7	=	49.35	(78)		

	_														
South	0.9x	0.77	X	4.	8	X	46.75		X	0.4	X	0.7	=	43.54	(78)
South	0.9x	0.77	X	5.4	14	X	76.57		X	0.4	X	0.7	=	80.82	(78)
South	0.9x	0.77	×	4.	8	X	76.57		X	0.4	X	0.7	=	71.31	(78)
South	0.9x	0.77	X	5.4	14	X	97.53		X	0.4	X	0.7	=	102.95	(78)
South	0.9x	0.77	X	4.	8	X	97.53		x	0.4	X	0.7	=	90.84	(78)
South	0.9x	0.77	X	5.4	14	X	110.23	3	X	0.4	X	0.7	=	116.36	(78)
South	0.9x	0.77	X	4.	8	X	110.23	3	x	0.4	X	0.7	=	102.67	(78)
South	0.9x	0.77	X	5.4	14	X	114.87	7	X	0.4	X	0.7	=	121.26	(78)
South	0.9x	0.77	X	4.	8	X	114.87	7	x	0.4	X	0.7	=	106.99	(78)
South	0.9x	0.77	X	5.4	14	x	110.55	5	x	0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77	х	4.	8	x	110.55	5	x	0.4	X	0.7	=	102.96	(78)
South	0.9x	0.77	X	5.4	14	x	108.01		x	0.4	X	0.7	=	114.01	(78)
South	0.9x	0.77	X	4.	8	х	108.01	1	x	0.4	X	0.7	=	100.6	(78)
South	0.9x	0.77	X	5.4	14	x	104.89	9	x	0.4	X	0.7	=	110.72	(78)
South	0.9x	0.77	X	4.	8	x	104.89	9	x	0.4	X	0.7	=	97.7	(78)
South	0.9x	0.77	x	5.4	14	x	101.89	•	x	0.4	x	0.7	=	107.55	(78)
South	0.9x	0.77	x	4.	8	x	101.89		x	0.4	x	0.7	<u>=</u>	94.9	(78)
South	0.9x	0.77	x	5.4	14	X	82.59	\equiv	Х	0.4	X	0.7	=	87.18	(78)
South	0.9x	0.77	×	4.	8	х	82.59	7	х	0.4	x	0.7	= -	76.92	(78)
South	0.9x	0.77	×	5.4	14	х	55.42	7	×	0.4	x	0.7	=	58.5	(78)
South	0.9x	0.77	x	4.	8	x	55.42	「	x	0.4	X	0.7	=	51.62	(78)
South	0.9x	0.77	×	5.4	14	x	40.4		Х	0.4	X	0.7		42.64	(78)
South	0.9x	0.77	x	4.	8	x	40.4	7	х	0.4	Х	0.7	=	37.63	(78)
West	0.9x	0.77	x	1.4	14	х	19.64		x	0.4	х	0.7	=	5.49	(80)
West	0.9x	0.77	x	1.4	14	х	38.42		x	0.4	x	0.7	=	10.74	(80)
West	0.9x	0.77	x	1.4	14	x	63.27		x	0.4	x	0.7	_ =	17.68	(80)
West	0.9x	0.77	x	1.4	14	x	92.28		x	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	x	1.4	14	x	113.09	9	x	0.4	x	0.7	<u> </u>	31.6	(80)
West	0.9x	0.77	x	1.4	14	x	115.77	, 	x	0.4	x	0.7	<u>=</u>	32.35	(80)
West	0.9x	0.77	x	1.4	14	х	110.22	<u> </u>	x	0.4	x	0.7	=	30.8	(80)
West	0.9x	0.77	×	1.4	14	x	94.68	一	x	0.4	x	0.7	=	26.45	(80)
West	0.9x	0.77	x	1.4	14	x	73.59	一	х	0.4	x	0.7		20.56	(80)
West	0.9x	0.77	×	1.4	14	x	45.59		x	0.4	×	0.7	-	12.74	(80)
West	0.9x	0.77	x	1.4	14	х	24.49	一	x	0.4	×	0.7	=	6.84	(80)
West	0.9x	0.77	×	1.4	14	х	16.15	ಠ	х	0.4	×	0.7	=	4.51	(80)
	L					ı			L						
Solar g	ains in	watts, cal	culated	d for eac	h mont	th		(83)m	= Sum(74)m	(82)m				
(83)m=	98.38	162.87	211.48	244.82	259.85	5	252 245	5.41	234.	88 223.01	176.8	3 116.95	84.78]	(83)
Total g	ains – i	nternal an	id sola	r (84)m :	= (73)n	า + (83)m , wa	itts						-	
(84)m=	483.97	546.46	583.01	597.03	592.6	5	65.95 547	7.11	542.	17 540.21	513.5	476.04	460.5]	(84)
7. Mea	an inter	nal tempe	erature	(heating	seaso	n)_									
Tempe	erature	during he	eating p	periods i	n the li	ving	area from	n Tabl	le 9,	Th1 (°C)				21	(85)
Utilisa	tion fac	ctor for ga	ins for	living ar	ea, h1,	m_(s	ee Table	9a)						_	
	Jan	Feb	Mar	Apr	May	/	Jun J	ul	Αι	ıg Sep	Oct	Nov	Dec]	
0		I 2 Version: 1												_	o E of 7

(86)m= 0.99 0.99 0.98 0.94 0.86 0.69 0.51 0.54 0.76 0.94 0.99 1]	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.07 20.22 20.42 20.66 20.86 20.97 21 20.99 20.95 20.71 20.35 20.05]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.08 20.08 20.08 20.1 20.1 20.11 20.11 20.12 20.11 20.1 20.]	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.99 0.99 0.97 0.92 0.82 0.61 0.41 0.44 0.69 0.92 0.98 0.99]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_	
(90)m= 18.85 19.07 19.36 19.7 19.96 20.09 20.11 20.11 20.07 19.78 19.27 18.82		(90)
$fLA = Living area \div (4) =$	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	_	
(92)m= 19.35 19.54 19.79 20.09 20.33 20.45 20.47 20.47 20.43 20.16 19.71 19.32]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1	(00)
(93)m= 19.35 19.54 19.79 20.09 20.33 20.45 20.47 20.47 20.43 20.16 19.71 19.32		(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	Jaiate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:	1	(0.4)
(94)m= 0.99 0.98 0.97 0.92 0.83 0.65 0.45 0.48 0.72 0.92 0.98 0.99		(94)
Useful gains, hmGm, W = (94)m x (84)m (95)m= 479.93 537.31 563.24 552.12 492.69 365.13 248.72 260.28 387.24 473.6 467.42 457.5	1	(95)
Monthly average external temperature from Table 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 for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	-	
(97)m= 1013.82 982.98 889.74 737.57 566.46 378.05 250.18 262.28 411.46 627.84 833.51 1006]	(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97) \text{m} - (95) \text{m}] \times (41) \text{m}$ (98) m = 397.22 299.49 242.92 133.53 54.89 0 0 0 114.75 263.58 408.09	1	
(98)m= 397.22 299.49 242.92 133.53 54.89 0 0 0 114.75 263.58 408.09 Total per year (kWh/year) = Sum(98) _{15,912} =	1914.46	(98)
		╡
Space heating requirement in kWh/m²/year	28.57	(99)
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources;	the latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		7
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 heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	_
Annual space heating requirement	1914.46]

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2010.19	(307a)
Efficiency of secondary/supplementary heating system in % (fror		0](308
Space heating requirement from secondary/supplementary syste		0] (309)
			J` ′
Water heating Annual water heating requirement		1791.08	1
If DHW from community scheme:	(0.1) (000) (005) (000)		J
Water heat from Community heat pump	$(64) \times (303a) \times (305) \times (306) =$	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =		(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from a	putside	119.54	(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) =	119.54	(331)
Energy for lighting (calculated in Appendix L)		315.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (332)(237b) =	3807.64	(338)
12b. CO2 Emissions – Community heating scheme			
	3 7	r Emiss <mark>ions</mark> kg CO2/vear	
CO2 from other sources of space and water heating (not CHP)	kWh/year kg CO2/kWh	r 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		kg CO2/year](367a)
Efficiency of heat source 1 (%) If there is CHP using	kWh/year kg CO2/kWh	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(307b)+(307b)]	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for	kg CO2/year	
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel 256 = 788.8	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems (307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(3	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x (309) x	kg CO2/year uel	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f 310b)] x 100 ÷ (367b) x 0.52 313) x 0.52 363)(366) + (368)(372) 309) x 0 0 0 0 0 0 0 0 0 0 0 0 0	kg CO2/year uel](367)](372)](373)](374)](375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel](367)](372)](373)](374)](375)](376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh two fuels repeat (863) to (366) for the second f 310b)] x 100 ÷ (367b) x 0.52 313) x 0.52 363)(366) + (368)(372) 309) x 0 0 0 0 0 0 1 1 1 1 1 1 1	kg CO2/year uel](367)](372)](373)](374)](375)](376)](378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantanee Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwellin CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applications.	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 (0us heater (312) x 0.22 (373) + (374) + (375) = (19 (331)) x 0.52 (332))) x 0.52	kg CO2/year uel	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 (0us heater (312) x 0.22 (373) + (374) + (375) = (19 (331)) x 0.52 (332))) x 0.52	kg CO2/year uel	(367) (372) (373) (374) (375) (376) (378) (379) (380)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1 Total CO2, kg/year sum of (376)(382) =	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 (0us heater (312) x 0.22 (373) + (374) + (375) = (19 (331)) x 0.52 (332))) x 0.52	kg CO2/year uel](367)](372)](373)](374)](375)](376)](378)](379)](380)](383)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 4 (Bottom) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3 (2a) = (3a) 67 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) total main secondary other m³ per hour heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) 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) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjusted infiltr	ation rate	e (allowii	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	0.27	0.3	0.32	0.33	0.35		
Calculate effe		_	rate for t	he appli	cable ca	se			!	!	!	•	1,00
If mechanic			ndiv N. (2	2h) _ (22a) Em. (a	auation (N	JEN otho	auioo (22h) - (22a)			0	(23a)
If exhaust air h) = (23a)			0	(23b)
									21.) (001) [4 (00.)	0	(23c)
a) If balance								<u> </u>	, 	- 	<u>`</u>	÷ 100] I	(24a)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ea mecha 0	anicai ve		without	neat red	overy (N	//V) (24b	0 m = (22)	$\frac{26)m + (2)}{0}$	23b) 0		1	(24b)
(24b)m= 0			0							0	0		(240)
c) If whole h	nouse ext n < 0.5 ×			•	•				5 v (23h)			
(24c)m = 0	0.0 1	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	لــــــــــــــــــــــــــــــــــــــ	n or wh	ole hous	e nositiv	/e innut	ventilatio	n from l	oft.					` '
,	n = 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)
Effective air	change	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) 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 losse	e and he	at lose r	aramoto	or.									_
ELEMENT	Gros		Openin		Net Ar	ea	U-vali	IE.	AXU		k-value	<u></u>	ΑΧk
	area		m		A ,r		W/m2		(W/I	K)	kJ/m ² ·l		kJ/K
Doors					2.4	х	1	=	2.4				(26)
Windows Type	e 1				1.44	x1,	/[1/(1.4)+	0.04] =	1.91	П			(27)
Windows Type	e 2				5.44	x1,	/[1/(1.4)+	0.04] =	7.21	П			(27)
Windows Type	e 3				4.8	x1,	/[1/(1.4)+	0.04] =	6.36	5			(27)
Floor					67	x	0.13		8.71	= [(28)
Walls Type1	31.7	7	10.24	4	21.46	x	0.18	=	3.86	F i		7 7	(29)
Walls Type2	19	=	1.44	=	17.56	=	0.18	= :	3.16	=		7	(29)
Walls Type3	11.1	_	2.4	=	8.7	X	0.18	=	1.57	=		-	(29)
Walls Type4	2.4		0	=	2.4	x	0.18	=	0.43	룩 ;		3	(29)
Total area of e	L				131.2	=	0.10		0.40				(31)
* for windows and			ffective wi	ndow U-va			ı formula 1	/[(1/U-valı	ue)+0.041 a	as aiven in	paragraph	3.2	(31)
** include the are						atou uomg	romaia i	I mo vale	10) 10.0 13 0	io givoii iii	paragrapi	. 0.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				35.6	2 (33)
Heat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5726	68 (34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses can be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cald	culated u	using Ap	pendix ł	<						6.56	(36)
if details of therm. Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			42.1	8 (37)
Ventilation he		alculated	monthly	/					= 0.33 × (25)m x (5))	72.1	<u> </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	~ _		-l-,			L				L		l	

	()
(38)m= 37.92 37.74 37.56 36.71 36.55 35.81 35.81 35.67 36.09 36.55 36.87 37.21	(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
(39)m= 80.1 79.91 79.73 78.88 78.72 77.98 77.98 77.85 78.27 78.72 79.05 79.38	(20)
Average = Sum(39) ₁₁₂ /12= $\frac{78.88}{40}$ Heat loss parameter (HLP), W/m ² K $\frac{40}{m} = \frac{39}{m} \div 4$	(39)
(40)m= 1.2 1.19 1.18 1.17 1.16 1.16 1.16 1.17 1.17 1.18 1.18	
Average = $Sum(40)_{112}/12=$ 1.18 Number of days in month (Table 1a)	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.17	(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)	
(44)m= 94.34 90.91 87.48 84.05 80.62 77.19 77.19 80.62 84.05 87.48 90.91 94.34	
Total = Sum(44) ₁₋₁₂ = 1029.1	18 (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= 139.91 122.36 126.27 110.08 105.63 91.15 84.46 96.92 98.08 114.3 124.77 135.49	
Total = Sum(45) ₁₁₂ = 1349.4 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)
	(46)
(46)m= 20.99 18.35 18.94 16.51 15.84 13.67 12.67 14.54 14.71 17.15 18.72 20.32 Water storage loss:	(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$	(50)
b) If manufacturer's declared cylinder loss factor is not known:	(55)
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52) (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)

Primary circuit loss (annual) fro						(0		(58)
Primary circuit loss calculated for	,	, ,	, , ,		thormo	otot)			
(modified by factor from Table (59)m= 23.26 21.01 23.26	22.51 23.26		23.26 23.26	22.51	23.26	22.51	23.26		(59)
` '			<u> </u>						, ,
Combi loss calculated for each (61)m= 0 0 0	$\frac{\text{month } (61)\text{m} = (61)\text{m}}{0} = (61)\text{m}$	60) ÷ 365	× (41)m	0	0	0	0		(61)
Total heat required for water he								(F0)m + (G1)m	
(62)m= 186.5 164.45 172.86	155.17 152.22		131.06 143.52	143.17	160.9	169.86	182.09	(59)111 + (61)111	(62)
Solar DHW input calculated using Appe			!						(02)
(add additional lines if FGHRS					Contributi	on to wate	i ricating)		
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0 0	0	0	0	0		(63) (G2
Output from water heater									
(64)m= 186.5 164.45 172.86	155.17 152.22	136.24 1	131.06 143.52	143.17	160.9	169.86	182.09		
			Outp	out from wa	iter heater	· (annual) _{1.}	12	1898.03	(64)
Heat gains from water heating,	kWh/month 0.25	5 ´ [0.85 ×	(45)m + (61)m	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	_
(65)m= 83.79 74.35 79.26	72.68 72.4	-	65.36 69.5	68.68	75.28	77.56	82.33	-	(65)
include (57)m in calculation of	of (65)m only if cy	/linder is i	n the dwelling	or hot wa	ater is fr	om com	munity h	eating	
5. Internal gains (see Table 5							·		
Metabolic gains (Table 5), Watt									
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56	108.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	pendix L, equation	on L9 or L	9a), also see	Table 5					
(67)m= 17.41 15.46 12.58	9.52 7.12	6.01	6.49 8.44	11.33	14.38	16.79	17.89		(67)
Appliances gains (calculated in	Appendix L, equ	uation L13	or L13a), also	see Tab	ole 5				
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 1	142.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	pendix L, equati	on L15 or	· L15a), also se	ee Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86	33.86 33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	ia)	•	•	•					
(70)m= 3 3 3	3 3	3	3 3	3	3	3	3		(70)
Losses e.g. evaporation (negat	ive values) (Tabl	e 5)	•	•					
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -	-86.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)	-	-	-						
(72)m= 112.63 110.65 106.53	100.94 97.31	92.19	87.85 93.42	95.4	101.18	107.72	110.65		(72)
Total internal gains =		(66)m	+ (67)m + (68)m -	+ (69)m + (7	70)m + (7	1)m + (72)	m		
(73)m= 378.8 376.85 364.87	345.64 326.23	307.45	295.2 300.74	310.58	330.01	352.32	368.92		(73)
6. Solar gains:									
Solar gains are calculated using solar			ed equations to co	nvert to the	e applicab		ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table	e 6a T	g_ able 6b	Ta	FF able 6c		Gains (W)	
South 0.9x 0.77 x	5.44	x 46.7	75 X	0.63	_ x _	0.7	=	77.73	(78)

	_					_		_						
South	0.9x	0.77		X	4.8	X	46.75	×	0.63	X	0.7	=	68.58	(78)
South	0.9x	0.77		X	5.44	X	76.57	X	0.63	X	0.7	=	127.3	(78)
South	0.9x	0.77		X	4.8	X	76.57	X	0.63	X	0.7	=	112.32	(78)
South	0.9x	0.77		x	5.44	x	97.53	X	0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77		x	4.8	x	97.53	×	0.63	x	0.7	=	143.08	(78)
South	0.9x	0.77		x	5.44	x	110.23	X	0.63	x	0.7	=	183.27	(78)
South	0.9x	0.77		x	4.8	x	110.23	X	0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77		X	5.44	X	114.87	×	0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77		X	4.8	X	114.87	X	0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77		X	5.44	X	110.55	×	0.63	X	0.7	=	183.79	(78)
South	0.9x	0.77		x	4.8	x	110.55	×	0.63	×	0.7	=	162.17	(78)
South	0.9x	0.77		X	5.44	X	108.01	X	0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77		x	4.8	x	108.01	×	0.63	x	0.7	=	158.45	(78)
South	0.9x	0.77		x	5.44	X	104.89	X	0.63	x	0.7	=	174.39	(78)
South	0.9x	0.77		x	4.8	x	104.89	X	0.63	x	0.7	=	153.87	(78)
South	0.9x	0.77		x	5.44	x	101.89	×	0.63	x	0.7	=	169.39	(78)
South	0.9x	0.77		x	4.8	x	101.89	X	0.63	x [0.7	=	149.46	(78)
South	0.9x	0.77		X	5.44	X	82.59	×	0.63	Х	0.7	=	137.3	(78)
South	0.9x	0.77		x	4.8	х	82.59	x	0.63	х	0.7	=	121.15	(78)
South	0.9x	0.77		x	5.44	х	55.42] ×	0.63	х	0.7	=	92.13	(78)
South	0.9x	0.77		x	4.8	x	55.42	x	0.63	х	0.7	=	81.29	(78)
South	0.9x	0.77		x	5.44	x	40.4	X	0.63	х	0.7	=	67.16	(78)
South	0.9x	0.77		x	4.8	x	40.4	X	0.63	х	0.7	=	59.26	(78)
West	0.9x	0.77		x	1.44	x	19.64	X	0.63	х	0.7	=	8.64	(80)
West	0.9x	0.77		x	1.44	x	38.42	X	0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77		x	1.44	x	63.27	X	0.63	X	0.7	=	27.85	(80)
West	0.9x	0.77		x	1.44	x	92.28	X	0.63	×	0.7	=	40.61	(80)
West	0.9x	0.77		x	1.44	x	113.09	X	0.63	x	0.7	=	49.77	(80)
West	0.9x	0.77		x	1.44	x	115.77	X	0.63	x	0.7	=	50.95	(80)
West	0.9x	0.77		x	1.44	x	110.22	X	0.63	×	0.7	=	48.51	(80)
West	0.9x	0.77		x	1.44	x	94.68	×	0.63	x	0.7	=	41.67	(80)
West	0.9x	0.77		x	1.44	x	73.59	X	0.63	x	0.7	=	32.39	(80)
West	0.9x	0.77		x	1.44	x	45.59	×	0.63	x	0.7	=	20.06	(80)
West	0.9x	0.77		x	1.44	x	24.49	X	0.63	x [0.7	=	10.78	(80)
West	0.9x	0.77		x	1.44	x	16.15	×	0.63	x	0.7	=	7.11	(80)
Ť				$\overline{}$	for each mon	-		_	n = Sum(74)m				Ī	
` ′ L	154.95	256.53	333.0		385.59 409.2		96.91 386.53	369	.93 351.23	278.51	184.2	133.53		(83)
т					$\frac{(84)m = (73)r}{734.00}$	<u> </u>		1	a a	l aaa -		F.c. :-	Ī	(0.4)
(84)m=	533.75	633.37	697.	95	731.22 735.4	9 7	04.36 681.72	670	.67 661.81	608.52	536.52	502.45		(84)
				•	heating seas									
-		_			eriods in the li	_			, Th1 (°C)				21	(85)
Utilisat				$\overline{}$	ving area, h1	Ť			<u> </u>	1	1	1	1	
L	Jan	Feb	Ma	ar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
04	0 4 D 004	0.1/	405	-4 (0	AD 0.02) http://	/							D	5 of 7

						•					•	•	ı	
(86)m=	0.99	0.98	0.96	0.92	0.83	0.67	0.49	0.52	0.74	0.93	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.88	20.08	20.33	20.61	20.83	20.96	20.99	20.99	20.93	20.65	20.2	19.84		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.92	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.94	19.93		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling,	h2,m (se	e Table	9a)					'	
(89)m=	0.99	0.98	0.95	0.9	0.78	0.57	0.38	0.41	0.65	0.9	0.98	0.99		(89)
Mean	interna	l temner	ature in	the rest	of dwelli	na T2 (f	allow ste	ns 3 to	7 in Tabl	e 9c)			l	
(90)m=	18.45	18.74	19.1	19.5	19.78	19.92	19.95	19.95	19.89	19.56	18.94	18.4		(90)
` ,									f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Moon	intorno	ltompor	oturo (fo	r tha wh	مام طبیره	llina\ fl	Λ., Τ1	. /4 fl	Λ) Το					
(92)m=	19.03	19.29	ature (fo	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(92)
									ere appro		10.40	10.00		(5-)
(93)m=	19.03	19.29	19.6	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(93)
	ace hea	ting requ	uirement											
•		•			e obtain	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a				· · · · · ·					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm											(0.4)
(94)m=	0.99	0.97	0.95	0.9	0.79	0.61	0.43	0.46	0.68	0.9	0.98	0.99		(94)
(95)m=		617,4	W = (94)	4)M X (84 654.69	581.4	429.59	291.61	305.62	453.17	548.67	523.48	497.96		(95)
			rnal tem				291.01	303.02	455.17	340.07	323.40	497.90		(33)
(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)
									L – (96)m					, ,
	1180.11		1044.63	871.6	669.77	447.95	294.18	309.17	486.44	740.03	976.5	1173.88		(97)
Space	e heatin	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=	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2320.89	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								34.64	(99)
9a. En	erav rec	ıuiremer	nts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	CHP)					
	e heatir					,	3		,,,,					
•		_	at from se	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	-	•	ry/supple			a svstem	າ. %						0	(208)
	•							۸۰۰۵	Con	Oct	Nov	Doo		`
Snac	Jan e heatin	Feb a require	Mar ement (c	Apr alculate	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	yeai
Opaci	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
(211)m			(4)] } x 1						-					(211)
(411)11	519.24	382.55	304.14	167.03	70.32	0	0	0	0	152.27	348.85	537.84		(211)
	·	300	I	31.00					l (kWh/yea				2482.24	(211)
									•	·	10,1012			` ′

Space heating fuel (secondary), kWh/month								
$= \{[(98)m \times (201)]\} \times 100 \div (208)$								
(215)m= 0 0 0 0 0	0 0		0	0	0	0		_
		Tota	al (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating								
Output from water heater (calculated above) 186.5 164.45 172.86 155.17 152.22 1	136.24 131.	.06 143.52	143.17	160.9	169.86	182.09		
Efficiency of water heater	130.24 131.	143.52	143.17	160.9	109.00	162.09	70.0	(216)
	79.8 79.	8 79.8	79.8	84.49	86.53	87.39	79.8	(217)
` '	79.6 79.	0 79.0	79.0	04.49	00.33	07.39		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
	170.73 164	23 179.84	179.41	190.43	196.31	208.37		
	•	Tota	al = Sum(2	19a) ₁₁₂ =			2260.02	(219)
Annual totals				k\	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							2482.24	
Water heating fuel used							2260.02	
Electricity for pumps, fans and electric keep-hot						'		_
central heating pump:						30		(230c)
boi <mark>ler with a fan-assisted flue</mark>						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							307.48	(232)
Total delivered energy for all uses (211)(221) +	(231) + (23	32)(23 7 b)	=				5124.74	(338)
12a. CO2 emissions – Individual heating system	ns including	micro-CHF	2					<u> </u>
	Energy kWh/ye			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	536.16	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	488.16	(264)
Space and water heating	(261) + (2	62) + (263) +	(264) =				1024.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	159.58	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1222.83	(272)

TER =

(273)

18.25

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height:

67 m² Floor 0 3 m

27.5 m² (fraction 0.41) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
DOOR	Manufacturer	Solid			Wood
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	
Ralcony	Manufacturer	Windows	low-E En - 0.05 soft coat	No	

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
E		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Type-Name: Location: Width: Height: Name: Orient: Worst case **DOOR** INT 0 Ε East 0 0 Balcony Ε East 0

More than average Overshading:

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elements	<u>S</u>						
E	29.4	8.96	20.44	0.15	0	False	N/A
INT	12	2.4	9.6	0.16	0.43	False	N/A
Spandrel	2.44	0	2.44	0.35	0	False	N/A
Exposed	67			0.11			N/A
Internal Elements	6						

Party Elements

Thermal bridges:

No information on thermal bridging (y=0.15) (y=0.15)

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 5 (Bottom) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 3 (2a) = (3a) 67 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) total main secondary other m³ per hour heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

0.15	0.15	e (allowi	0.13	0.12	0.11	0.11	(21a) x	(22a)m 0.12	0.12	0.13	0.14		
Calculate effe		••••		_	l -	_	0.11	0.12	0.12	0.13	0.14		
If mechanica	al ventila	ition:									[0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		[0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	Table 4h) =			[79.05	(23
a) If balance	ed mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (23b) × [1 - (23c)	÷ 100]	
(24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r				•	re input v o); otherv				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r				•	e input verwise (2				0.5]		-		
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(25
3. Heat losse	c and he	at loce i	o aramote	or.								_	
ELEMENT	Gros		Openin		Net Ar	ea	U-valu	IE.	AXU		k-value	Δ	Χk
	area		m		A ,n		W/m2		(W/I	<)	kJ/m²-k		J/K
Doo <mark>rs</mark>					2.4	х	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	e 1				4.16	x .	1/[1/(1)+	0.04] =	4				(27
Windows Type	2				4.8	x .	1/[1/(1)+	0.04] =	4.62				(27
loor					67	X	0.11	=	7.37	٦ [¬	(28
Walls Type1	29.4	4	8.96		20.44	. x	0.15	=	3.07			$\bar{1}$	(29
Walls Type2	12		2.4		9.6	X	0.15	=	1.44			ī	(29
Walls Type3	2.4	4	0		2.44	x	0.35	<u> </u>	0.85	T i		ī	(29
Total area of e	lements	, m²			110.8	4							(31
for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	re)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and pan	titions		(2.2)	(22)			-		
abric heat los	·	•	U)				(26)(30)	` '			Į	24.7	(33
Heat capacity		,						***	.(30) + (32)	, , ,	(32e) = [5479.72	(34
hermal mass	•	•		•					tive Value			250	(3
For design assess an be used inste				construct	ion are not	known pr	ecisely the	ndicative	values of	IMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix k	<					Г	16.63	(30
f details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he	at loss							(33) +	(36) =		[41.33	(3
otal labile lie	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)) -		
/entilation hea		I 1.104	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	Feb	Mar	Αρι	iviay			†				1		
/entilation hea	Feb 16.59	16.39	15.43	15.24	14.27	14.27	14.08	14.66	15.24	15.62	16.01		(38
/entilation hea	16.59	16.39				14.27	14.08		15.24 = (37) + (3		16.01		(38

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.83	0.84	0.84	0.85	0.86		
	!					!			Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day	1	1 ` ` 	<u> </u>						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		17		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed i			se target o		5.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x			!				
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
										ım(44) ₁₁₂ =		1029.18	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,ı	m x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous w	vater heati	ing at point	of use (no	hot water	storage)	enter () in	hoxes (46		Total = Su	ım(45) ₁₁₂ =		1349.41	(45)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage		10.94	10.51	15.04	13.07	12.07	14.54	14.71	17.13	10.72	20.32		(40)
Storage volum	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		الممسمام	ft-	ممادة	/1.\^/1	- /-l -> -\ .							(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage		1			Ι		. , ,	(55) × (41)	ı				(=0)
(56)m= 32.01 If cylinder contains	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	Sv. LT	(56)
				· · ·					ını where (,HII) IS IIO		хп	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	`	,									0		(58)
Primary circuit				,	•		, ,		(1.	-1-1			
(modified by			ı —	ı —	ı —			-		- 	00.00		(EO)
(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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	n month	(62)n	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.18	172.29	181.54	163.58	160.9	144.64	139.74	152.	2 151.57	169.58	178.26	190.77		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribu	tion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	18.03	16.04	16.49	14.58	14.03	12.18	11.28	12.9	4 13.08	15.09	16.32	17.54		(63) (G2)
Output	t from wa	ater hea	ter										_	
(64)m=	174.47	153.83	162.37	146.4	144.19	129.86	125.78	136.	58 135.89	151.81	159.35	170.55		_
								(Output from w	ater heate	er (annual)	112	1791.08	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	90.74	80.63	86.21	79.4	79.34	73.1	72.31	76.4	5 75.41	82.23	84.28	89.27		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelli	ng or hot w	vater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.5	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	n <mark>g g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	^r L9a), a	lso se	e Table 5					
(67)m=	18.93	16.81	13.67	10.35	7.74	6.53	7.06	9.17	12.31	15.63	18.25	19.45		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble <mark>5</mark>				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.3	32 145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)), alsc	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.8	6 33.86	33.86	33.86	33.86		(69)
Pumps	s and far	ns gains	(Table 5	āa)									_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					_		_	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.8	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	121.96	119.98	115.87	110.27	106.64	101.53	97.18	102.7	75 104.73	110.52	117.06	119.99		(72)
Total i	internal	gains =	1			(66)	m + (67)m	ı + (68)	m + (69)m +	(70)m + (7	71)m + (72))m		
(73)m=	386.65	384.53	372.3	352.8	333.19	314.31	302.1	307.8	317.9	337.6	360.11	376.81		(73)
6. So	lar gains	S:												
	-		•	r flux from	Table 6a		-	tions to	convert to the	he applica		tion.		
Orient	ation: A	Access F Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	T	FF able 6c		Gains (W)	
East	0.9x	0.77	X	4.1	6	x 1	9.64	x	0.4	x	0.7	=	15.85	(76)
East	0.9x	0.77	x	4.	8	x 1	9.64	х	0.4	×	0.7	<u> </u>	18.29	(76)
East	0.9x	0.77	x	4.1	6	x 3	8.42	x	0.4	x [0.7	=	31.01	(76)
East	0.9x	0.77	х	4.	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(76)
	<u>L</u>		•	•										_

	г		_						1		_				_
East	0.9x	0.77	×	4.1	16	X	6	3.27	X	0.4	×	0.7	=	51.07	(76)
East	0.9x	0.77	X	4.	8	X	6	3.27	X	0.4	X	0.7	=	58.93	(76)
East	0.9x	0.77	X	4.1	16	X	9	2.28	X	0.4	X	0.7	=	74.49	(76)
East	0.9x	0.77	X	4.	8	X	9	2.28	X	0.4	X	0.7	=	85.95	(76)
East	0.9x	0.77	X	4.1	16	X	1	13.09	X	0.4	X	0.7	=	91.29	(76)
East	0.9x	0.77	X	4.	8	X	1	13.09	X	0.4	X	0.7	=	105.33	(76)
East	0.9x	0.77	X	4.1	16	X	1	15.77	X	0.4	X	0.7	=	93.45	(76)
East	0.9x	0.77	X	4.	8	X	1	15.77	X	0.4	×	0.7	=	107.83	(76)
East	0.9x	0.77	X	4.1	16	X	1	10.22	X	0.4	X	0.7	=	88.97	(76)
East	0.9x	0.77	X	4.	8	X	1	10.22	X	0.4	X	0.7	=	102.66	(76)
East	0.9x	0.77	X	4.1	16	X	9	4.68	x	0.4	X	0.7	=	76.42	(76)
East	0.9x	0.77	X	4.	8	X	9	4.68	X	0.4	X	0.7	=	88.18	(76)
East	0.9x	0.77	X	4.1	16	X	7	3.59	X	0.4	X	0.7	=	59.4	(76)
East	0.9x	0.77	X	4.	8	X	7	3.59	X	0.4	X	0.7	=	68.54	(76)
East	0.9x	0.77	X	4.1	16	X	4	5.59	X	0.4	X	0.7	=	36.8	(76)
East	0.9x	0.77	X	4.	8	X	4	5.59	X	0.4	×	0.7	=	42.46	(76)
East	0.9x	0.77	X	4.1	16	X	2	4.49	X	0.4	X	0.7	=	19.77	(76)
East	0.9x	0.77	X	4.	8	X	2	4.49	Х	0.4	X	0.7	=	22.81	(76)
East	0.9x	0.77	X	4.1	16	х	1	6.15	x	0.4	×	0.7	=	13.04	(76)
East	0.9x	0.77	x	4.	8	х	1	6.15] x	0.4	×	0.7	=	15.04	(76)
			ш						7						
Sola <mark>r g</mark>	ains in	watts, calcu	lated	for eac	h month	1			(83)m	n = Sum(74)m.	(<mark>8</mark> 2)m				
											_		1	7	
(83)m=	<mark>3</mark> 4.15		0.01	160.44	196.62		01.28	191.63	164	1.6 127.94	79.26	42.58	28.08		(83)
Total g	ains – i	nternal and	solar	(84)m =	= (73)m	+ (8	33)m	watts	I				· · · · · ·		, ,
` ' L		nternal and				+ (8			16 ⁴		79.26 416.8		28.08]	(83)
Total g	ains – i 420.8	nternal and	solar 32.31	(84)m = 513.24	= (73)m 529.81	+ (8	33)m	watts	I				· · · · · ·		, ,
Total ga (84)m= 7. Mea	ains – i 420.8 an inter	nternal and 451.33 48	solar 32.31 ature	(84)m = 513.24 (heating	529.81 season	+ (8	8 3) m 15.59	watts 493.72	472	.41 445.84			· · · · · ·	21	, ,
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature	nternal and 451.33 48 nal tempera	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in	= (73)m 529.81 season the liv	+ (8	33)m 15.59 area f	watts 493.72 from Tak	472	.41 445.84			· · · · · ·	21	(84)
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature	nternal and 451.33 48 nal temperator during heat	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in	= (73)m 529.81 season the liv	+ (8	33)m 15.59 area f	watts 493.72 from Tak	472 ole 9	.41 445.84		6 402.69	· · · · · ·	21	(84)
Total garage (84)m= 7. Mea	ains – i 420.8 an inter erature tion fac	nternal and 451.33 48 rnal tempera during heat ctor for gains	solar 32.31 ature ting p	(84)m = 513.24 (heating eriods in iving are	529.81 season the livea, h1,n	+ (8	33)m 15.59 area f ee Ta	watts 493.72 From Tab ble 9a)	472 ole 9	.41 445.84 , Th1 (°C)	416.8	6 402.69	404.89	21	(84)
Total graph (84)m= [7. Mean Temporal Utilisan (86)m= [ains – i 420.8 an inter erature ation fact Jan 1	nternal and 451.33 48 rnal tempera during heat ctor for gains	solar 32.31 ature ting p s for l Mar	(84)m = 513.24 (heating eriods in iving are Apr 0.96	529.81 season the liv ea, h1,n May	+ (8	33)m 15.59 area f ee Ta Jun 0.67	rom Tab ble 9a) Jul 0.49	472 ole 9,	.41 445.84 , Th1 (°C) ug Sep	416.8 Oc	6 402.69	404.89 Dec	21	(84)
Total graph (84)m= [7. Mean Temporal Utilisan (86)m= [ains – i 420.8 an inter erature ation fact Jan 1	nternal and 451.33 48 nal temperated during heat exter for gains Feb I 0.99 0	solar 32.31 ature ting p s for l Mar	(84)m = 513.24 (heating eriods in iving are Apr 0.96	529.81 season the liv ea, h1,n May	+ (8	33)m 15.59 area f ee Ta Jun 0.67	rom Tab ble 9a) Jul 0.49	472 ole 9,	.41 445.84 , Th1 (°C) ug Sep 54 0.8	416.8 Oc	6 402.69 t Nov 0.99	404.89 Dec	21	(84)
Total graph (84)m= [7. Metalogous Temporal Utilisa (86)m= [Mean (87)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19	nternal and 451.33 48 nal temperator for gains Feb I 0.99 0	solar 32.31 ature ting p s for l Mar 0.99 re in l	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f	+ (% 5·	area f ee Ta Jun 0.67 w ste	493.72 From Take ble 9a) Jul 0.49 ps 3 to 7	472 ole 9 0.5	.41 445.84 , Th1 (°C) ug Sep .64 0.8 .7able 9c) 1 20.95	Oc: 0.97	6 402.69 t Nov 0.99	404.89 Dec 1	21	(84)
Total graph (84)m= [7. Metalogous Temporal Utilisa (86)m= [Mean (87)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19	nternal and 451.33 48 nal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat	solar 32.31 ature ting p s for l Mar 0.99 re in l	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f	+ (8 5 5 or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or 1) or	area f ee Ta Jun 0.67 w ste	493.72 From Take ble 9a) Jul 0.49 ps 3 to 7	472 ole 9 0.5	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95 9, Th2 (°C)	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	404.89 Dec 1	21	(84)
Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m=	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2	temperature 20.29 20.22 2	solar 32.31 ature ting p s for l Mar 0.99 re in l 0.47 ting p	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21	529.81 Season the livea, h1,n May 0.86 ea T1 (frace 20.9) rest of 20.22	+ (8 5 5 n) iing m (see follo 2 2 f dw	area free Ta Jun 0.67 w stee 0.98 relling	watts 493.72 From Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23	472 A 0.57 in T 2 able 9	.41 445.84 , Th1 (°C) ug Sep 64 0.8 Table 9c) 1 20.95 9, Th2 (°C)	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17	21]	(84) (85) (86) (87)
Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m=	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2	nternal and 451.33 48 nal temperate during heat stor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2	solar 32.31 ature ting p s for l Mar 0.99 re in l 0.47 ting p	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21	529.81 Season the livea, h1,n May 0.86 ea T1 (frace 20.9) rest of 20.22	+ (8 5 5 n) n) ing (see 1	area free Ta Jun 0.67 w stee 0.98 relling	watts 493.72 From Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23	472 A 0.57 in T 2 able 9	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .D, Th2 (°C) .23 20.22	Oc: 0.97	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17		(84) (85) (86) (87)
Total graph (84)m= [7. Metalon (86)m= [Mean (87)m= [Tempor (88)m= [Utilisa (89)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1	nternal and 451.33 48 nal temperate during heat extor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 extor for gains 0.99 0	solar 32.31 ature ting p s for l Mar 0.99 re in 0.47 ting p 20.2 s for r	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of di 0.94	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82	+ (((5 5) 1) 1) 1) 1) 1) 1) 1) 1) 1	area f ee Ta Jun 0.67 w ste 0.98 relling 0.23 m (se 0.6	rom Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 pe Table 0.41	472 Ai 0.5 7 in T 2 able 9 20. 9a) 0.4	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .9, Th2 (°C) .23 20.22	Oc 0.97 20.72 20.95	6 402.69 t Nov 0.99 2 20.42	Dec 1 20.17 20.21		(84) (85) (86) (87) (88)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m= Mean	ains – i 420.8 an inter erature tion fac Jan 1 interna 20.19 erature 20.2 tion fac 1	nternal and 451.33 48 rnal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 ctor for gains 0.99 0 I temperatu	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r	(84)m = 513.24 (heating eriods in iving are 0.96 living are 20.71 eriods in 20.21 eest of di 0.94 the rest	= (73)m 529.81 season the liv ea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area free Ta Jun 0.67 w stee 0.98 relling 0.63 m (see 0.6	rom Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23 ee Table 0.41 bllow ste	472 A 0.5 in T 2 able 9 0.4 0.5 20. 9a) 0.4	.41	Oc 0.97 20.72 20.95	6 402.69 t Nov 0.99 2 20.42 2 20.21	Dec 1 20.17 20.21]	(84) (85) (86) (87) (88)
Total graph (84)m= [7. Metalon (86)m= [Mean (87)m= [Tempor (88)m= [Utilisa (89)m= [ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1	nternal and 451.33 48 rnal temperal during heat ctor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 ctor for gains 0.99 0 I temperatu	solar 32.31 ature ting p s for l Mar 0.99 re in 0.47 ting p 20.2 s for r	(84)m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of di 0.94	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 0.98 relling 0.23 m (se 0.6	rom Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 pe Table 0.41	472 Ai 0.5 7 in T 2 able 9 20. 9a) 0.4	.41 445.84 Th1 (°C) ug Sep i4 0.8 Table 9c) 1 20.95 9, Th2 (°C) 23 20.22 15 0.73 to 7 in Table 23 20.19	20.72 20.72 20.97 20.95 e 9c)	6 402.69 t Nov 0.99 2 20.42 2 20.21 0.99	Dec 1 20.17 20.21 1 19.09		(84) (85) (86) (87) (88) (89)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m=	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1 interna 19.1	nternal and 451.33 48 nal temperaturing heat extor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperature 19.25 19	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r 0.98 re in 1	(84) m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of d 0.94 the rest 19.87	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 20.98 m (se 0.6 T2 (fo	from Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41 bllow stee 20.23	472 Ai	.41 445.84 .Th1 (°C) ug Sep .64 0.8 .Table 9c) 1 20.95 .9, Th2 (°C) .23 20.22 .5 0.73 .to 7 in Table .23 20.19	20.72 20.72 20.97 20.95 e 9c)	1 Nov 0.99 2 20.42 2 20.21 0.99	Dec 1 20.17 20.21 1 19.09	21	(84) (85) (86) (87) (88) (89)
Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean	ains – i 420.8 an interestion factor Jan 1 interna 20.19 erature 20.2 ation factor 1 interna 19.1 interna 19.1	nternal and 451.33 48 rnal temperate during heat extor for gains Feb I 0.99 0 I temperatu 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperatu 19.25 15 I temperatu	solar 32.31 ature ting p s for I Mar 0.99 re in 1 0.47 ting p 20.2 s for r 0.98 re in r 9.51	(84) m = 513.24 (heating eriods in iving are 20.71 eriods in 20.21 rest of do 0.94 the rest 19.87	(73)m 529.81 Season the livea, h1,n May 0.86 ea T1 (f 20.9 rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area free Ta Jun 0.67 w stee 0.98 relling 0.65 T2 (fo 0.22	ywatts 493.72 From Take ble 9a) Jul 0.49 ps 3 to 7 21 from Take 20.23 ee Table 0.41 bllow stee 20.23	472 AA 0.5 in T 2 able 9 0.4 ps 3 20. + (1	.41	Oc: 0.97 20.72 20.22 0.95 e 9c) 19.9 LA = Li	6 402.69 t Nov 0.99 2 20.42 2 20.21 0.99 19.46 ving area ÷ (1 20.17 20.21 1 19.09 4) =		(84) (85) (86) (87) (88) (89) (90) (91)
Total g (84)m= 7. Me Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m=	ains – i 420.8 an inter erature etion fac Jan 1 interna 20.19 erature 20.2 tion fac 1 interna 19.1	nternal and 451.33 48 nal temperaturing heat extor for gains Feb I 0.99 0 I temperature 20.29 20 during heat 20.2 2 extor for gains 0.99 0 I temperature 19.25 19 I temperature 19.67 1	solar 32.31 ature ting p s for I Mar 0.99 re in I 0.47 ting p 20.2 s for r 0.98 re in 1 9.51	(84) m = 513.24 (heating eriods ir iving are 0.96 living are 20.71 eriods ir 20.21 rest of d 0.94 the rest 19.87 r the wh	= (73)m 529.81 season the livea, h1,n May 0.86 ea T1 (f 20.9 n rest of 20.22 welling, 0.82 of dwel 20.11	+ (8 5 5 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	area f ee Ta Jun 0.67 w ste 20.98 m (se 0.6 T2 (fo 20.22	watts 493.72 from Tak ble 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.23 ee Table 0.41 bllow ste 20.23 A × T1 20.54	472 An An An An An An An An An An An An An A	.41	Oc 0.97 20.72 20.22 0.95 e 9c) 19.9 LA = Li	1 Nov 0.99 2 20.42 2 20.21 0.99 19.46 2 19.85	Dec 1 20.17 20.21 1 19.09		(84) (85) (86) (87) (88) (89)

		1				T		l			l			(00)
` '		0.67	19.9	20.21	20.44	20.53	20.54	20.54	20.5	20.24	19.85	19.53		(93)
	e heating the mea				ro obtair	and at et	on 11 of	Table Ok	o so tha	t Ti m-(76)m an	d ro-calc	ulato	
	ation fac					ieu ai sii	5p 11 01	i abic 3i), 50 iiia		rojili ali	u ie-caic	uiaie	
Γ,	Jan F	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	n factor	for ga	ins, hm	:										
(94)m=	1 0.	.99	0.98	0.94	0.83	0.63	0.44	0.48	0.76	0.95	0.99	1		(94)
Useful g	ains, hm		W = (94)	1)m x (84	4)m	1								
` ′		7.64	473.1	483.44	442.06	323.33	218.68	228.6	337.53	396.95	398.63	403.37		(95)
	average													(00)
()		.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	s rate for	r mea _{5.69}	773.75	al tempe 642.13	494.16	Lm , VV =	=[(39)m 219.26	x [(93)m- 229.62	- (96)m 358.42		726.2	879.21		(97)
` '	86.02 85 eating re					l				545.05	<u> </u>	679.21		(97)
	Ť	4.21	223.69	114.26	38.77	0	0.02	0	0	110.19	235.85	354.02		
(00)=	11.0		220.00	111.20	00.11				•		r) = Sum(9	L	1698.58	(98)
Casas b	ooting ro	auira	mant in	Is\A/lb/m2	2hroor			7014	i poi youi	(RVVIII) y Cal) = Ca m(c	O)15,912 —		= ' '
·	eating re	•											25.35	(99)
9b. Energ					Ĭ									
This part Fraction of											unity sch	neme.	0	(301)
	'							Table I	1) 0 11 11	OHO				=
Fraction of						•							1	(302)
The commu includes bo	-					-				up to four	other heat	sources; th	he latter	
Fraction	· ·	/ -				Tom power	Stations.	осс Аррсі	Idix O.				1	(303a)
Fraction of			7			eat numr				(3	02) x (303	a) –	1	(304a)
											02) X (303	α) – 		╡`
Factor for					,	` ''		•	iting sys	tem		ļ	1	(305)
Distribution	on loss fa	actor (Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space he	•												kWh/yea	r
Annual sp	pace hea	ting r	equirem	nent									1698.58	
Space he	eat from C	Comm	nunity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	= [1783.51	(307a)
Efficiency	of seco	ndary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space he	eating rec	uiren	nent froi	m secon	darv/sui	oplemen	tarv svst	tem	(98) x (30	01) x 100 ·	÷ (308) =	ľ	0	(309)
·					,,,,,,,,		, ,	-	, , ,	•	, ,	l	-	 `
Water he	_	ina ra	auirom	ont								Ī	4704.00	_
Annual w		•	•									l	1791.08	
If DHW fr Water he)				(64) x (30	03a) x (30	5) x (306) :	<u> </u>	1880.63	(310a)
Electricity			•					0.01	× [(307a).	(307e) +	· (310a)((310e)] =	36.64	(313)
Cooling S					n				2()	,	` , ,	' ' '	0	(314)
Space co	•	-		•		n if not 4	enter (1)		= (107) ÷	(314) =		 	0	(315)
•	• •						,		- (101) -	(5.4) =			U	(515)
Electricity mechanic								outside				[119.54	(330a)
22.161.110				- / = / 11	P							l		`

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	119.54	(331)
Energy for lighting (calculated in Appendix L)			334.24	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	3599.75	(338)
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 256	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	742.85	(367)
Electrical energy for heat distribution	[(313) x	0.52	19.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(373	2) =	761.86	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		761.86	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	62.04	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	173.47	(379)
Energy saving/generation technologies (333) to (334) as application 1	able	0.52 × 0.01 =	-268.93	(380)
Total CO2, kg/year sum of (376)(382) =			728.45	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.87	(384)
El rating (section 14)			91.28	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201			Stroma Softwa	are Vei	rsion:	om)	Versio	on: 1.0.5.51	
Address :		FI	operty <i>i</i>	Address:	Sample	3 (BOIII	OIII)			
1. Overall dwelling dimer	nsions:									
0 1"				a(m²)		Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor				67	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e))+(1n))	67	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	d)+(3e)+	(3n) =	201	(5)
2. Ventilation rate:										_
		econdary eating	1	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [0] = [0	X	40 =	0	(6a)
Number of open flues	0 +	0	+ -	0	Ī - [0	x	20 =	0	(6b)
Number of intermittent fan	is		·			2	x	10 =	20	(7a)
Number of passive vents					F	0	x	10 =	0	(7b)
Number of flueless gas fire	es				F	0	X ·	40 =	0	(7c)
		A. (0L) . (7-	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \						nanges per ho	our
Infiltration due to chimney If a pressurisation test has be					continue fr	20 om (9) to (\div (5) =	0.1	(8)
Number of storeys in the		a, proceda	10 (17), 0	ni ioi wido c	ortando in	0111 (0) 10 ((10)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening	•	oonding to	the great	er wall are	a (after					
If suspended wooden flo	• /- •	ed) or 0.1	l (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught sti	ripped							0	(14)
Window infiltration				0.25 - [0.2		-	(45)		0	(15)
Infiltration rate		:		(8) + (10)					0	(16)
Air permeability value, or If based on air permeabilit	•		•	•	•	etre of e	envelope	area	5	(17)
Air permeability value applies	•					is being u	sed		0.35	(18)
Number of sides sheltered				•	,	J			3	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.27	(21)
	r monthly wind speed							•	7	
Infiltration rate modified fo		1								
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan Feb I	Mar Apr May eed from Table 7				•	·	1]	
Jan Feb I	Mar Apr May	Jun	Jul 3.8	Aug	Sep 4	Oct 4.3	4.5	Dec 4.7]	
Jan Feb I	Mar Apr May eed from Table 7				•	·	1]	

0.35	0.34	0.33	0.3	0.29	d wind s	0.26	0.25	0.27	0.29	0.3	0.32		
alculate effe		l											
If mechanica	al ventila	ition:										0	(2
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)), othe	wise (23b) = (23a)			0	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(2
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
la)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	/IV) (24b)m = (22)	2b)m + (23b)		•	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•								
if (22b)n		(23b), t	· ` `	c) = (23b	ŕ	<u> </u>	c) = (22b		5 × (23b) -		i	
lc)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural									0.51				
if (22b)n ld)m= 0.56	0.56	en (24d) 0.56	m = (220)	0.54	0.53	0.53	0.5 + [(2	0.54	0.5]	0.55	0.55	Ī	(2
′ L						<u> </u>	<u> </u>		0.54	0.55	0.55		(2
Effective air	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	(2
5)m= 0.56	0.56	0.56	0.54	0.54	0.55	0.55	0.55	0.54	0.34	0.55	0.55		(2
. Heat losse	s and he	eat loss	oaramete	er:									
LEMENT	Gros		Openin	-	Net Ar		U-valu		AXU		k-value		AXk
oors	area	(1112)	m	² 	A ,r	_	W/m2		(W/I	N)	kJ/m²-l	`	kJ/K
					2.4	X	1	= [2.4	H			(2
in <mark>dows</mark> Type					4.16		/[1/(1.4)+	, i	5.52	H			(2
indows Type	2				4.8	x1,	/[1/(1.4)+	0.04] =	6.36	빝.			(2
oor					67	X	0.13	= [8.71	<u></u>		<u> </u>	(2
alls Type1	29.4	4	8.96	<u> </u>	20.44	X X	0.18	=	3.68				(2
alls Type2	12		2.4		9.6	Х	0.18	=	1.73				(2
alls Type3	2.4	4	0		2.44	X	0.18	= [0.44				(2
tal area of e	lements	, m²			110.8	4							(3
or windows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
include the area				ls and par	titions		(0.0)	(20)					
bric heat los		•	U)				(26)(30)					28.84	
eat capacity		,	_						.(30) + (32	, , ,	(32e) =	5479.7	_
ermal mass	•	•		,					tive Value			250	(3
r design assess n be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
ermal bridge				usina Ar	pendix l	<						5.54	(3
letails of therma	•	,		•	-	•						3.34	(
tal fabric he			()		•/			(33) +	(36) =			34.38	(3
entilation hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
37.12	36.97	36.82	36.11	35.98	35.36	35.36	35.25	35.6	35.98	36.24	36.52		(3
, ····=									·			ı	
	:oefficier	nt W/K						(39)m	$= (37) + \ell$	38)m			
eat transfer of	oefficier	nt, W/K	70.49	70.35	69.74	69.74	69.62	(39)m 69.98	70.35	38)m 70.62	70.9		

leat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.06		
lumber of day	s in mor	oth (Tabl	0 10)				<u>!</u>		Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
<u> </u>								•		•			
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		17		(42)
nnual averagi educe the annua ot more that 125	e hot wa I average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)			•			
4)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
nergy content of	hot water	used - cal	culated ma	onthly -4	190 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =		1029.18	(44
5)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
139.91	122.50	120.21	110.00	103.03	91.13	04.40	90.92			m(45) ₁₁₂ =		1349.41	(45
instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46						``
6)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46
Vater storage torage torage		ípoludio	a any ca	olar or M	///IIDC	ctorago	within co	amo voc	col		450		(47
community h	,							arric ves	301		150		(47
therwise if no	_			-			, ,	ers) ente	er '0' in (47)			
/ater storage													
a) If manufacti				or is kno	wn (kWł	n/day):				1.	39		(48
emperature fa										0.	54		(49
nergy lost fro		_	-		!4		(48) x (49)) =		0.	75		(50
) If manufactedlot water stora			-								0		(51
community h	•			- (,	.,,					<u> </u>		(0)
olume factor	_										0		(52
emperature fa	actor fro	m Table	2b								0		(53
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (54) in (5	55)								0.	75		(55
/ater storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
6)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(50
cylinder contains	dedicated	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
i7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57
rimary circuit	loss (an	nual) fro	m Table	3							0		(58
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fr	om Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	a cylinde	r thermo	stat)			
•													

Combi	i loss ca	lculated	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 h	neat req	uired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		(62)
Solar DI	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	•	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
		-		-		-	-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	ude (57)	m in cald	culation o	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. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	s (Table	5), Wat	ts									_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	<mark>ig g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	18.37	16.32	13.27	10.05	7.51	6.34	6.85	8.91	11.95	15.18	17.72	18.89		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	s and fa	ns gains	(Table 5	 5a)		-	-	-		-	-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	/aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)				=	=		=	-			
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65		(72)
Total i	internal	gains =	:			(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	379.77	377.7	365.57	346.16	326.63	307.78	295.56	301.21	311.21	330.81	353.25	369.91		(73)
6. So	lar gains	s:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat		ion.		
Orient		Access F		Area		Flu		-	g_ 	_	FF		Gains	
	ļ	Table 6d		m²			ole 6a	. <u> </u>	able 6b		able 6c	<u></u>	(W)	_
East	0.9x	0.77	X	4.1	6	x 1	9.64	X	0.63	x	0.7	=	24.97	(76)
East	0.9x	0.77	х	4.8	3	x 1	9.64	х	0.63	x	0.7	=	28.81	(76)
East	0.9x	0.77	Х	4.1	6	x 3	88.42	X	0.63	x	0.7	=	48.85	(76)
East	0.9x	0.77	X	4.8	3	x 3	88.42	X	0.63	X	0.7	=	56.36	(76)

East	0.9x	0.77	X	4.16	X	63.2	27	x	0.63	x	0.7		=	80.44	(76)
East	0.9x	0.77	X	4.8	X	63.2	27	X	0.63	x	0.7		=	92.82	(76)
East	0.9x	0.77	X	4.16	X	92.2	28	x	0.63	X	0.7		=	117.32	(76)
East	0.9x	0.77	X	4.8	X	92.2	28	x	0.63	x	0.7		=	135.37	(76)
East	0.9x	0.77	X	4.16	X	113	.09	x	0.63	X	0.7		=	143.78	(76)
East	0.9x	0.77	X	4.8	X	113	.09	x	0.63	X	0.7		=	165.9	(76)
East	0.9x	0.77	X	4.16	X	115	.77	x	0.63	x	0.7		=	147.18	(76)
East	0.9x	0.77	X	4.8	X	115	.77	x	0.63	x	0.7		=	169.83	(76)
East	0.9x	0.77	X	4.16	X	110	.22	x	0.63	x	0.7		=	140.13	(76)
East	0.9x	0.77	X	4.8	X	110	.22	x	0.63	x	0.7		=	161.68	(76)
East	0.9x	0.77	X	4.16	X	94.0	68	x	0.63	X	0.7		=	120.37	(76)
East	0.9x	0.77	X	4.8	X	94.0	68	x	0.63	x	0.7		=	138.88	(76)
East	0.9x	0.77	X	4.16	X	73.	59	x	0.63	x	0.7		=	93.56	(76)
East	0.9x	0.77	X	4.8	X	73.	59	x	0.63	x	0.7		=	107.95	(76)
East	0.9x	0.77	X	4.16	X	45.	59	x	0.63	X	0.7		=	57.96	(76)
East	0.9x	0.77	X	4.8	X	45.	59	x	0.63	x	0.7		=	66.88	(76)
East	0.9x	0.77	X	4.16	X	24.4	49	x	0.63	x	0.7		=	31.13	(76)
East	0.9x	0.77	X	4.8	X	24.4	49	Х	0.63	X	0.7		=	35.92	(76)
East	0.9x	0.77	x	4.16	x	16.	15	x	0.63	х	0.7		=	20.53	(76)
East	0.9x	0.77	x	4.8	х	16.	15	×	0.63	Х	0.7		=	23.69	(76)
Solar g	ains in	watts, calcul	ated	for each m	nonth		(8	83)m	= Sum(74)m	. <mark>(8</mark> 2)m					
(83)m=	53.78	105.21 173	3.26	252.69 30	9.68			83)m 259.:		.(82)m 124.84	4 67.06	44.23	3		(83)
(83)m=	53.78		3.26	252.69 30	9.68						4 67.06	44.23	3		, ,
(83)m=	53.78	105.21 173	s.26 solar	252.69 30 (84)m = (7	9.68 3 (3)m + (83)m , v	301.81 watts		25 201.51			44.23			(83) (84)
(83)m= Total g (84)m=	53.78 ains — ii 433.55	105.21 173	3.26 solar 3.83	252.69 30 (84)m = (7 598.85 63	99.68 3 (3)m + (36.31	83)m , v	301.81 watts	259.	25 201.51	124.84					, ,
(83)m= Total g (84)m= 7. Me	53.78 ains — ii 433.55 an inter	105.21 173 nternal and s 482.91 538	3.26 solar 3.83 ure (252.69 30 (84)m = (7 598.85 63 heating se	9,68 3 (3)m + (36.31 (83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	, ,
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	(84)
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat during heati tor for gains	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se eriods in the ving area,	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71 Th1 (°C)	124.84	4 420.3		14	21	(84)
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – in 433.55 an inter erature ation fac	105.21 173 nternal and s 482.91 538 nal temperat during heati tor for gains	3.26 solar 3.83 ture (ng pe for li	252.69 30 (84)m = (7 598.85 63 heating seeriods in the ving area, Apr	29,68 3 (3)m + (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (36.31 (83)m , v 624.8 5 area fro	301.81 watts 597.37 om Table e 9a)	560.de 9,	25 201.51 46 512.71 Th1 (°C)	124.8- 455.6-	4 420.3	414.1	14	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	53.78 ains – ii 433.55 an inter erature ation fac Jan 1	105.21 173 nternal and s 482.91 538 nal temperate during heati tor for gains Feb M	3.26 solar 3.83 cure (ng pe for li	252.69 30 (84)m = (7 598.85 63 heating seed or in the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of t	23)m + (23)m + (236.31	area frosee Tabl Jun 0.68	01.81 vatts 597.37 cm Table e 9a) Jul 0.51	259.: 560.: le 9,	25 201.51 46 512.71 Th1 (°C) ug Sep 6 0.82	124.84 455.64	4 420.3 Nov	414.1 De	14	21	(84)
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(93)m= 19.13	19.3	19.6	19.99	20.28	20.41	20.44	20.43	20.36	19.98	19.49	19.1		(93)
8. Space hea	ting requ	uirement											
Set Ti to the					ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	ī									١		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	0.98	0.93	0.82	0.63	0.44	0.5	0.77	0.95	0.99	1	1	(94)
Useful gains,	<u> </u>	ļ			0.03	0.44	0.5	0.77	0.93	0.99	'	İ	(01)
(95)m= 431.37	478.35	526.41	558.24	522.37	391.03	265.65	277.6	395.38	434.69	416.08	412.49		(95)
Monthly average								000.00		110.00	1.12.10	l	,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	an intern	al tempe	erature,	L Lm , W =	L =[(39)m :	x [(93)m	 – (96)m	1	ļ		l	
(97)m= 1060.36		932.66	781.63	603.7	405.41	267.51	280.88	437.95	660.12	875.06	1056.59		(97)
Space heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		l	
(98)m= 467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
							Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	2337.86	(98)
Space heatin	a require	ement in	kWh/m²	/vear								34.89	(99)
·	• .			•			:	NID)				04.00	
9a. Energy red	•	nts – Indi	viduai n	eating s	ystems i	nciuaing	micro-C	JHP)					
Space heating Fraction of sp		t from se	econdar	//supple	mentary	system						0	(201)
Fraction of sp					y		(202) = 1 -	(201) =				1	(202)
							(204) = (204)		(202)] _				╡` ′
Fraction of to							(204) = (2)	02) 🗓 [1 –	(203)] =			1	(204)
Efficiency of r												93.5	(206)
Efficiency of s	seconda	ry/supple	ementar	y heating	system	1, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin)							1	
467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
(211)m = {[(98)m x (20	4)] } x 1	00 ÷ (20	6)								-	(211)
500.5	394.55	323.26	172.02	64.72	0	0	0	0	179.37	353.44	512.52		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,101}	Ē	2500.39	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									
$= \{[(98)m \times (20)]\}$		00 ÷ (20	_			i						1	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating													
Output from w					400.04	404.00	442.50	440.47	400.0	400.00	400.00	1	
186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09	70.0	7(246)
Efficiency of w			24.04	00.50	70.0	70.0		T = 0	0.4.00	00.50	07.00	79.8	(216)
(217)m= 87.17	86.91	86.29	84.91	82.58	79.8	79.8	79.8	79.8	84.92	86.56	87.28	İ	(217)
Fuel for water $(219)m = (64)$	_												
(219)m = 213.95	189.22	200.33	182.75	184.34	170.73	164.23	179.84	179.41	189.46	196.24	208.63		
							Tota	I = Sum(2	19a) ₁₁₂ =	ı	ı	2259.13	(219)
Annual totals									k'	Wh/yeaı	•	kWh/year	
Space heating		ed, main	system	1						•		2500.39	
													_

Water heating fuel used				2259.13	1
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				324.5	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			5159.01	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa		Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	540.08	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	487.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1028.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	168.41	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		1235.39](272)](273)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 55.1 m²

Floor 0 3 m

26 m² (fraction 0.472) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nam	ne:	Source	:	Type:	Glazing:		Argon:	Frame:
DOOF	R	Manufac	urer	Solid				Wood
W		Manufac	urer	Windows	low-E, $En = 0$.05 <mark>, soft</mark> coat	No	
Balco	ny	Manufac	urer	Windows	low-E, $En = 0$.05, soft coat	No	

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
Balcony		W	West	0	0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>s</u>						
W	24	8.96	15.04	0.15	0	False	N/A
INT	24	2.4	21.6	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Exposed	55.1			0.11			N/A
Internal Elements	S						

Party Elements

Thermal bridges:

No information on thermal bridging (y=0.15) (y=0.15)

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 6 (Bott	om)			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (2\		Av. Ha	: a.b.4/\		Value a/m²	1
Ground floor					a(m²) 55.1	(1a) x		ight(m)	(2a) =	Volume(m ²	(3a)
Total floor area TFA = (1	a)+(1b)+(1c))+(1d)+(1e	e)+(1r	n) :	55.1	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:											
Number of chimneys	main heatin		econdai neating 0	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ı r
Number of open flues	0	╡+ ፟	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa		L				J	0		10 =	0	(7a)
						Ļ			10 =		╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	rires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimne	eys, flues and	I fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has I			ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			<u>-</u>
Number of storeys in t Additional infiltration	he dw <mark>elling</mark> (ns)						1(0)	41.04	0	(9)
Structural infiltration: () 25 for steel	or timbor	frome or	. 0. 25 fo	r maaani	n, constr	ruotion	[(9)	-1]x0.1 =	0	= (10)
if both types of wall are p						•	uction			0	(11)
deducting areas of open	ings); if equal us	ser 0.35		-		·					
If suspended wooden		•	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window Window infiltration	s and doors	araugnt si	ırıppea		0.25 - [0.2	2 x (14) ÷ 1	001 -			0	(14)
Infiltration rate					•	+ (11) + (1	•	+ (15) =		0	(15)
Air permeability value,	a50 expres	sed in cub	oic metre	s per ho	. , , ,	. , ,	, , ,		area	3	(17)
If based on air permeabi				•	•	•			G	0.15	(18)
Air permeability value appli	-						is being us	sed			` ′
Number of sides sheltered	ed									3	(19)
Shelter factor					` ,	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorpora	_				(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified			1	1		-	-			1	
Jan Feb	Mar Apr		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1	l		T			T	T	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	

0.15	0.15	e (allowi	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe		_	rate for t	he appli	cable ca	se	<u> </u>				<u> </u>		
If mechanica												0.5	(2:
If exhaust air h		0		, ,	,	. ,	,, .	•) = (23a)		l	0.5	(2:
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2
a) If balance	ı —					- ` 	HR) (24a	``	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance	ı —						<u> </u>	<u> </u>	 				
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•					F (22h	.\			
$\frac{\text{if } (\angle \angle D) \text{fi}}{(\angle AC) \text{m} = 0}$	n < 0.5 ×	(23b), t	nen (240	(230) = (230)	o); otnerv	wise (24)	C) = (220)	0) M + 0.	5 × (230	0	0		(2
						<u> </u>			0	0			(2
d) If natural if (22b)n		on or wn en (24d)		•	•				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse					NI at A a				A >/ 1.1				V I
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valu W/m2		A X U (W/I	<)	k-value kJ/m²-k		X k J/K
oors					2.4	x	1.4	= [3.36				(2
/indows Type	1				4.16	x	1/[1/(1)+	0.04] =	4	Ħ			(2
Vindows Type					4.8		1/[1/(1)+	L L	4.62	Ħ			(2
loor					55.1	×	0.11] = [6.061	۲,		7	_ (2
/alls Type1	24		8.96		15.04	=	0.11		2.26	믁 ¦		┨ ├─	—\(^2
Valls Type2				_		=		=		믁 ¦		$\exists \vdash$	—\(\frac{1}{2}
Valls Type3	24		2.4		21.6	×	0.15	=	3.23				=
• •	2.4	<u>i</u>	0		2.4	x	0.35	=	0.84				(2
otal area of e			.ffa ativa vui	ndow II ve	105.5		, formula 1	/F/1/II.vol	·a) · 0 041 a	a siran in	n	2.2	(3
for windows and include the area						ated using	i iorriiula 1	/[(e)+0.04j a	is giveri iri	paragrapri	3.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.37	(3
eat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	4679.06	<u> </u>
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	i	250	<u> </u>
or design assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste						_					ı		_
hermal bridge	•	,			•	<					l	15.83	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =		ı	40.19	(3
entilation hea		alculated	l monthly	,					$= 0.33 \times ($	25)m x (5)	l '	40.19	(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	13.64	13.48	12.69	12.53	11.74	11.74	11.58	12.06	12.53	12.85	13.17		(3
8)m= 13.8					I	I	ι	L	. 2.55	ı	l . Ŭ ,		,
· L		-+ \^\"						(0.0)	(07)	20) -			
88)m= 13.8 leat transfer of 53.99	coefficier 53.83	nt, W/K 53.67	52.88	52.72	51.93	51.93	51.77	(39)m 52.25	= (37) + (3 52.72	38)m 53.04	53.36		

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.98	0.97	0.96	0.96	0.94	0.94	0.94	0.95	0.96	0.96	0.97		
	!	!				!			Average =	Sum(40) ₁	12 /12=	0.96	(40)
Number of day		`							<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		84		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		7.91		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		
_						_				ım(44) ₁₁₂ =		934.88	(44)
Energy content of		used - cal					OTm / 3600						
(45)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		–
If inst <mark>antane</mark> ous w	vater heati	ng at point	of use (no	n hot water	storage).	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	_	1225.78	(45)
(46)m= 19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Water storage		17.2	10	14.55	12.72	11.01	10.21	13.50	10.07	17	10.40		(10)
Storage volum	ne (litres)) includir	ng any so	olar or <mark>W</mark>	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		oolorod l	ooo foot	or io kno		2/d0x/):							(40)
a) If manufact				oi is kiio	WII (KVVI	i/uay).					0		(48)
Temperature f							(40) (40)	\			0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage					Ι			(55) × (41)	ı				(=0)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	iv Ll	(56)
If cylinder contains										1		IA I I	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•		, ,		(1.	-1-1			
(modified by			ı —		ı —			<u> </u>		- 	00.00		(EO)
(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)

Comb	i loss ca	lculated	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 I	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.36	161.08	169.97	153.49	151.23	136.29	132	143.32		159.11	166.83	178.35		(62)
Solar D	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	16.59	14.71	15.14	13.33	12.81	11.05	10.22	11.77	11.91	13.81	14.97	16.12	•	(63) (G2)
Outpu	t from w	ater hea	ter											
(64)m=	163.1	143.95	152.16	137.57	135.73	122.64	119.09	128.87	7 128.08	142.61	149.26	159.55		
		•				•		Ot	utput from wa	ater heate	r (annual)₁	12	1682.61	(64)
Heat o	gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	86.48	76.9	82.36	76.04	76.12	70.32	69.73	73.5	72.42	78.74	80.48	85.14		(65)
inclu	ude (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	ıs (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>tir</mark>	ng gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.29	13.58	11.05	8.36	6.25	5.28	5.7	7.41	9.95	12.63	14.74	15.72		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			•	
(68)m=	160.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooki	ng gains	(calcula	ited in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5			'	
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pump:	s and fa	ns gains	(Table 5	Ба)					•	!			ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (negat	ive valu	es) (Tab	le 5)			•	•	•		1	
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	[(71)
Water	heating	gains (T	able 5)						•				ı	
(72)m=	116.23	114.43	110.7	105.62	102.32	97.67	93.73	98.78	100.58	105.84	111.78	114.44		(72)
Total	internal	gains =				(66)	m + (67)m	+ (68)n	n + (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m=	342.57	340.73	330.26	313.56	296.88	280.66	270.06	275.17	7 283.69	300.57	319.89	334.13		(73)
6. So	lar gains	S:												
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu			g _	_	FF		Gains	
		Table 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
West	0.9x	0.77	X	4.1	6	x 1	9.64	х	0.4	X	0.7	=	15.85	(80)
West	0.9x	0.77	X	4.8	8	x 1	9.64	х	0.4	x	0.7	=	18.29	(80)
West	0.9x	0.77	X	4.1	6	x 3	8.42	x	0.4	x	0.7	=	31.01	(80)
West	0.9x	0.77	X	4.8	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(80)

			_					_						
West	0.9x	0.77	X	4.16	x	6	3.27	X	0.4	X	0.7	=	51.07	(80)
West	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	x	0.7	=	58.93	(80)
West	0.9x	0.77	X	4.16	Х	g	92.28	X	0.4	X	0.7	=	74.49	(80)
West	0.9x	0.77	X	4.8	X	9	92.28	X	0.4	X	0.7	=	85.95	(80)
West	0.9x	0.77	x	4.16	х	1	13.09	X	0.4	x	0.7	=	91.29	(80)
West	0.9x	0.77	x	4.8	х	1	13.09	X	0.4	X	0.7	=	105.33	(80)
West	0.9x	0.77	x	4.16	x	1	15.77	x	0.4	X	0.7	=	93.45	(80)
West	0.9x	0.77	X	4.8	х	1	15.77	X	0.4	X	0.7	=	107.83	(80)
West	0.9x	0.77	x	4.16	х	1	10.22	X	0.4	X	0.7	=	88.97	(80)
West	0.9x	0.77	x	4.8	х	1	10.22	x	0.4	x	0.7	=	102.66	(80)
West	0.9x	0.77	X	4.16	х	9	94.68	x	0.4	X	0.7	=	76.42	(80)
West	0.9x	0.77	x	4.8	х	9	94.68	X	0.4	X	0.7	=	88.18	(80)
West	0.9x	0.77	x	4.16	x	7	73.59	x	0.4	x	0.7	=	59.4	(80)
West	0.9x	0.77	x	4.8	x	7	73.59	x	0.4	x	0.7		68.54	(80)
West	0.9x	0.77	x	4.16	x	4	15.59	x	0.4	X	0.7		36.8	(80)
West	0.9x	0.77	x	4.8	×	4	15.59	x	0.4	X	0.7		42.46	(80)
West	0.9x	0.77	x	4.16	x	2	24.49	x	0.4	x	0.7		19.77	(80)
West	0.9x	0.77	x	4.8	X	2	24.49	Х	0.4	X	0.7	=	22.81	(80)
West	0.9x		(80)											
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	x	0.7	_ =	15.04	(80)
								7						
				Company of the	a makla			(00)	0 (74)	(00)				
Solar g	ains in	watts, calcul	ated	for each m	ionth			(83)m	1 = Sum(74)m	.(8Z)m			_	
Solar g (83)m=						201.28		`			_	28.08		(83)
(83)m=	34.15	66.8 110	0.01	160.44	6.62		191.63	`			_	28.08		(83)
(83)m=	3 <mark>4.15</mark> ains – ii	66.8 110 nternal and s	0.01 solar	160.44 19 (84)m = (7	96.62 (3)m +	(83)m	191.63 , watts	164	1.6 127.94	79.26	42.58			(83) (84)
(83)m= Total g	3 <mark>4.15</mark> ains — ii 376.72	66.8 110 nternal and s 407.53 440	0.01 solar 0.27	160.44 19 (84)m = (7 474 4	96.62 (3)m + 93.5	(83)m	191.63 , watts	164	1.6 127.94	79.26	42.58			, ,
(83)m= Total g (84)m= 7. Mea	3 <mark>4.15</mark> ains — ii 376.72 an inter	66.8 110 nternal and s 407.53 440 nal tempera	0.01 solar 0.27 ture (160.44 19 (84) m = $(7$ 474 49 (84) m seconds	96,62 (3)m + 93.5 (ason)	(83)m 481.94	191.63 , watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58			, ,
Total g (84)m= 7. Mea	ti													
Total g (84)m= 7. Mea	34.15 ains – in 376.72 an inter erature tion fac	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains	o.01 solar o.27 ture (ng po	160.44 19 (84)m = (7 474 49 heating seeriods in the ving area,	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94 g area t	191.63 , watts 461.69 from Tab	439 ble 9	.77 411.64 , Th1 (°C)	79.26	3 362.47	362.21	21	(84)
Total g (84)m= 7. Mea	34.15 ains – ii 376.72 an inter erature tion fac	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (7 474 4: (heating seeriods in the ving area, Apr	93.5 ason) e living h1,m ((83)m 481.94 g area t see Ta Jun	191.63 , watts 461.69 from Tab able 9a)	439 ole 9	.77 411.64 , Th1 (°C)	79.26 379.8	3 362.47 Nov	362.21 Dec	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	34.15 ains – ii 376.72 an inter erature tion fac Jan 1	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N 0.99 0.	o.01 solar o.27 ture (ng po for li	160.44 19 (84)m = (7 474 4: (heating seeriods in the ving area, Apr 0.95 0.95	96.62 93.5 93.5 e living h1,m (May 0.85	(83)m 481.94 g area t see Ta Jun 0.66	191.63 , watts 461.69 from Table 9a) Jul 0.49	164 439 ole 9 A	.77 411.64 , Th1 (°C) ug Sep	79.26 379.8	3 362.47 Nov	362.21 Dec	21	(84)
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I temperatur 20.19 20 during heati 20.1 20 tor for gains 0.99 0.	0.01 0.01 0.01 0.01 0.01 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.	160.44 19 (84)m = (7 474 4 heating selections in the ving area, Apr 0.95 0 iving area 20.66 2 eriods in re 20.12 2 est of dwel 0.93 0	96.62 (3)m + 93.5 (ason) e living h1,m (May 0.85 (T1 (foll) 0.88 est of d 0.12 (ling, h2) 0.8	(83)m 481.94 y area to see Ta Jun 0.66 ow ste 20.98 welling 20.13 2,m (sec	191.63 , watts 461.69 from Table 9a) Jul 0.49 ps 3 to 7 21 from Table 20.13 ee Table 0.4	439 AA 0.5 7 in T 20. 9a) 0.4	.77 411.64 .77 411.64 , Th1 (°C) ug Sep 53 0.79 Table 9c) 99 20.94 9, Th2 (°C) 13 20.13	79.26 379.8 Oct 0.96 20.68 20.12	3 362.47 Nov 0.99 2 20.11	Dec 1 20.06 20.11	21	(84) (85) (86) (87) (88)
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(83)m= Total g (84)m= 7. Mea Temp Utilisa (86)m= Mean (87)m= Utilisa (89)m= Mean (90)m= Mean	ains – ii 376.72 an inter erature tion fac Jan 1 interna 20.07 erature 20.1 tion fac 0.99 interna 18.87	66.8 110 Internal and s 407.53 440 Inal temperal during heatifor for gains Feb N 0.99 0. I temperatur 20.19 20 during heatifor for gains 0.99 0. I temperatur 19.03 19 I temperatur 19.03 19	o.01 solar one of ture (one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of the one of th	160.44	96.62 (3)m + 93.5 (ason) e living h1,m (May 0.85 (T1 (foll) 0.88 (est of d) 0.12 (ling, h2) 0.8 (dwellin) 20 (e) dwellin	(83)m 481.94 y area f see Ta Jun 0.66 ow ste 20.98 welling 20.13 2,m (se 0.58 g T2 (for 20.12	191.63 , watts 461.69 from Table 9a) Jul 0.49 ps 3 to 7 21 from Ta 20.13 ee Table 0.4 ollow ste 20.13	164 439 All 0.5 7 in T 20. 9a) 0.4 eps 3 20.	1.6 127.94 1.77 411.64 1.77 411.64 1.77 411.64 1.77 411.64 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.79 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70 Sep 1.70	79.26 379.8 Oct 0.96 20.68 20.12 0.94 e 9c) 19.75 A = Li	3 362.47 Nov 0.99 2 20.11 0.99 19.26 ving area ÷ (-	Dec 1 20.06 20.11 1 18.85 4) =	21	(84) (85) (86) (87) (88) (89) (90) (91)
(83)m = Total g (84)m = 7. Mean (86)m = Mean (87)m = Temp (88)m = Utilisa (89)m = Mean (90)m = Mean (92)m =	an interestion factors of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of	22.81 (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80) (80)												

(93)m= 19.44	19.58	19.83	20.17	20.41	20.52	20.54	20.54	20.49	20.19	19.76	19.42		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	L	l	<u> </u>										
(94)m= 0.99	0.99	0.98	0.93	0.82	0.62	0.44	0.48	0.75	0.95	0.99	0.99		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 374.3	403.06	429.5	441.63	405.39	299.4	203.63	212.72	309.59	359.08	357.76	360.31		(95)
Monthly aver		T T	·		r	•				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 (97)m= 817.25	e for me	an intern	595.82	erature, 459.34		=[(39)m : 204.56	<u> </u>	<u> </u>	505.4	674.70	042.02		(97)
(97)m= 817.25 Space heatin	<u> </u>				307.59	<u> </u>	214.28	333.61		671.72	812.02		(97)
(98)m= 329.56	260.12	212.84	111.02	40.14	0	0.02	0	0	108.86	226.05	336.07		
(60)111= 626.66	200.12	212.01	111.02	10.11				l per year		l .	<u> </u>	1624.65	(98)
Space heatin	a roquir	omont in	k\\/b/m2	2/voor			. 0.10	. poi you	(,) ca.	<i>)</i> ••••••(•	() 1		(99)
·	• .			•							l	29.49	(99)
9b. Energy red			The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	Ĭ									
This part is us Fraction of spa							.	•		unity scr	neme.	0	(301)
Fraction of spa								,				1	(302)
							-1/	CUID and	to form	- 11 11 1			(302)
The c <mark>ommu</mark> nity so inclu <mark>des boi</mark> lers, h									ip to four	otner neat	sources; tr	ne latter	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump				(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem		[1	(305)
Distribution los	ss factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m				ĺ	1.05	(306)
Space heating	g										L	kWh/yea	 r
Annual space	_	requiren	nent									1624.65	
Space heat fro	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	<u> </u>	1705.88	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/suլ	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	נ												
Annual water		equirem	ent									1682.61	
If DHW from c											,		_
Water heat fro		-)				(64) x (30	03a) x (30	5) x (306) :	= [1766.74	(310a)
Electricity use	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	34.73	(313)
Cooling Syste	m Energ	y Efficie	ncy Ration	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p							الالمقريم				ı		7(000.)
mechanical ve	entilation	- palanc	ea, extra	act or po	sitive in	put from	outside					98.31	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	9b) + (330g) =	98.31	(331)
Energy for lighting (calculated in Appendix L)			270.05	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	3322.82	(338)
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	256	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	704.02	(367)
Electrical energy for heat distribution	[(313) x	0.52	18.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2) =	722.04	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		722.04	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	51.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	140.16	(379)
Energy saving/generation technologies (333) to (334) as application 1	able	0.52 x 0.01 =	-268.93	(380)
Total CO2, kg/year sum of (376)(382) =			644.29	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.69	(384)
El rating (section 14)			91.38	(385)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	SAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
			Р	roperty.	Address	Sample	e 6 (Botte	om)			
Address :											
1. Overall dwelling dime	ensions:			Δ	- (m- 2)		Av. Ha	: a.b.4/\		Value a/m²	21
Ground floor					a(m²) 55.1	(1a) x		ight(m)	(2a) =	Volume(m 3	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+(1r	n) (1	55.1	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	ry +	other 0	7 = [total	x	40 =	m³ per hou	ı r (6a)
Number of open flues	0	<u> </u>	0	- - - - - -	0]	0	x	20 =	0	(6b)
Number of intermittent fa			U		U	J L			10 =		(7a)
						Ļ	2		10 =	20	Ⅎ`ໍ
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas fi	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and f	ans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b	een ca <mark>rried o</mark> ut o	r is intende	ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			_
Number of storeys in the	he dw <mark>elling</mark> (n	s)								0	(9)
Additional infiltration	OF for steel a	u 4iaab a u 4		0.25 fo				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p.						•	uction			0	(11)
deducting areas of opening			portuning to	o uno groun	o. man aro	a (artor					
If suspended wooden to		•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en										0	(13)
Percentage of windows	s and doors d	raught st	ripped		0.25 - [0.2	v (1.4) · . 1	001			0	(14)
Window infiltration Infiltration rate					•	. ,	00] = 12) + (13) +	ı (15) –		0	(15)
Air permeability value,	a50 everess	ad in cub	ic metre	s nar ha	. , , ,	, , ,	, , ,		area	0	(16)
If based on air permeabil				•		•	elle oi e	invelope	aica	0.37	(18)
Air permeability value applie	•						is being us	sed		0.37	(10)
Number of sides sheltere	ed									3	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorporat	ting shelter fac	ctor			(21) = (18	x (20) =				0.29	(21)
Infiltration rate modified f	or monthly wir	nd speed	l							1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7	-							1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4										
	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.27	0.29	0.31	0.32	0.34		
alculate effe		•	rate for t	he appli	cable ca	se	<u>!</u>		<u>I</u>	!			
If mechanica							.=					0	(2:
If exhaust air he		0		, ,	,		,, .	,) = (23a)			0	(2:
If balanced with		•	•	•		,						0	(2
a) If balance	i					- ` ` 	- 	<u> </u>	 	` 	``	÷ 100] I	(0
4a)m= 0			0	0	0	0	0	0	0	0	0		(2
b) If balance	ı	1	ı		1		, ``	<u> </u>	 	- 		I	(2
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	ve input v o); otherv				5 v (23k	2)			
4c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0		(2
d) If natural		<u> </u>			<u> </u>	<u> </u>					, ,		
					erwise (2				0.5]				
4d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(2
Effective air	change	rate - er	nter (24a) or (24k	b) or (24	c) or (24	d) in box	(25)	<u>.</u>	!			
5)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0 <mark>.55</mark>	0.55	0.56		(2
B. Heat losse	s and ne				Net Ar	200	U-valı	10	AXU		k-value		ΑΧk
LEMENT	area		Openin m		A ,r		W/m2		A X U (W/	K)	kJ/m²-ł		A A K kJ/K
oo <mark>rs</mark>					2.4	x	1	= [2.4	À			(2
in <mark>dows</mark> Type	1				4.16	x1.	/[1/(1.4)+	0.04] =	5.52	Ħ			(2
indows Type	2				4.8	x1.	/[1/(1.4)+	0.04] =	6.36	Ħ			(2
oor					55.1	X	0.13	=	7.163	=			(2
alls Type1	24		8.96		15.04	x	0.18	=	2.71	_		╡┝	`(2
/alls Type2	24		2.4	=	21.6	_	0.18	-	3.89	=		╡	(2
alls Type3				_		=		=		<u> </u>		╡	===
• •	2.4		0		2.4	×	0.18	=	0.43				(2
otal area of e			offoctivo wi	ndow I I ve	105.5		r formula 1	/[/1/ L valu	(0) 1 () () (1)	as aivan in	naragranh	. 2 2	(3
include the area						ateu using	i ioiiiiuia i	/[(1/ U- vaic	(C)+ 0.04] (as giveii iii	i paragrapri	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				28.47	(3
eat capacity	Cm = S((Axk)						((28)	.(30) + (3	2) + (32a)	(32e) =	4679.06	(:
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(;
r design assess				construct	tion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
n be used inste				icina Ar	nondiy l	,					ı	5.00	
nermal bridge details of therma	•	,		•	•	`						5.28	(;
otal fabric he		are not kii	OWII (30) =	= 0.03 X (3) <i>(</i>)			(33) +	(36) =			33.74	(3
entilation hea		alculated	l monthly	y						(25)m x (5))	23.17	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	30.8	30.66	30	29.88	29.31	29.31	29.2	29.53	29.88	30.13	30.39		(3
30.94	30.0					i .	l		L	<u> </u>	1		•
, <u> </u>	<u> </u>	<u> </u>			•		-	(20)~	- (37) + (38)m	-		
30.94 eat transfer of 64.68	<u> </u>	<u> </u>	63.75	63.62	63.05	63.05	62.95	(39)m 63.27	= (37) + (38)m 63.87	64.13	· [

Heat loss nara	Heat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $												
(40)m= 1.17	1.17	1.17	1.16	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16		
(40)111= 1.17	1.17	1.17	1.10	1.10	1.14	1.14	1.14					1.16	(40)
Average = $Sum(40)_{112}/12=$ 1.16 (40) Number of days in month (Table 1a)													(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>		l	<u> </u>				
4. Water heating energy requirement: kWh/ye											ear:		
Assumed occupancy, N $\frac{1.84}{\text{if TFA} > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)}$ if TFA £ 13.9, N = 1													(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)													(43)
										·			
Jan Hot water usage ir	Feb	Mar	Apr	May	Jun	Jul Table 10 V	Aug	Sep	Oct	Nov	Dec		
	,	uay ioi ea			r ctor mom	Table 10 X	, ,						
(44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		_
												934.88	(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= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		_
If inst <mark>antan</mark> eous w	ater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46)		Total = Su	m(45) ₁₁₂ =		1225.78	(45)
				-									(40)
(46)m= 19.06 Water storage	16.67	17.2	15	14.39	12.42	11.51	13.21	13,36	15.57	17	18.46		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel													(47)
If community heating and no tank in dwelling, enter 110 litres in (47)													
Otherwise if no	_			_				ers) ente	er '0' in <i>(</i>	47)			
Water storage			(-					, ,		,			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	Energy lost from water storage, kWh/year (48) x (49) = 0.75												(50)
b) If manufacturer's declared cylinder loss factor is not known:													()
Hot water storage loss factor from Table 2 (kWh/litre/day)													(51)
If community heating see section 4.3													
Volume factor from Table 2a 0													(52)
Temperature factor from Table 2b											0		(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$													(54)
Enter (50) or (54) in (55)													(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$													
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H													
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33													(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
· —	(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	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		(61)
Total he	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		(62)
Solar DH	W 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 ad	ditional	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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	134.18	150.42	158.43	169.67		_
								Οι	utput from wa	ater heate	r (annual)₁	12	1774.4	(64)
Heat ga	ains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	79.53	70.63	75.41	69.32	69.18	63.6	62.79	66.55	65.7	71.8	73.76	78.2		(65)
includ	de (57)r	n in calc	culation o	of (65)m	only if o	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a):									
Metabo	lic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>ting</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	14.88	13.21	10.74	8.13	6.08	5.13	5.55	7.21	9.68	12.29	14.34	15.29		(67)
Applian	i <mark>ce</mark> s gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5				
(68)m=	16 0.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooking	g gains	(calcula	ited in A	pendix	L, equat	ion L15	or L15a)	, also	see Table	5				
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61		(71)
Water h	neating	gains (T	able 5)											
(72)m=	106.9	105.1	101.36	96.28	92.98	88.34	84.39	89.45	91.25	96.5	102.44	105.11		(72)
Total in	nternal	gains =	1			(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	'1)m + (72)	m		
(73)m=	335.82	334.02	323.62	307	290.37	274.19	263.57	268.63	3 277.09	293.89	313.16	327.36		(73)
6. Sola	ar gains	:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		ccess Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
West	_							-					` '	7,000
West	0.9x	0.77	X	4.1		-	9.64	X	0.63		0.7	=	24.97	(80)
West	0.9x	0.77	x	4.8			9.64	X	0.63		0.7	=	28.81	(80)
West	0.9x	0.77	X	4.1		-	88.42	X	0.63	x	0.7	=	48.85	(80)
44G91	0.9x	0.77	Х	4.8	В	x 3	88.42	X	0.63	x	0.7	=	56.36	(80)

			_		_		_						
West	0.9x	0.77	X	4.16	X	63.27	X	0.63	X	0.7	=	80.44	(80)
West	0.9x	0.77	X	4.8	X	63.27	X	0.63	X	0.7	=	92.82	(80)
West	0.9x	0.77	X	4.16	X	92.28	X	0.63	X	0.7	=	117.32	(80)
West	0.9x	0.77	X	4.8	X	92.28	X	0.63	X	0.7	=	135.37	(80)
West	0.9x	0.77	X	4.16	X	113.09	X	0.63	x	0.7	=	143.78	(80)
West	0.9x	0.77	X	4.8	X	113.09	X	0.63	x	0.7	=	165.9	(80)
West	0.9x	0.77	X	4.16	x	115.77	X	0.63	x	0.7	=	147.18	(80)
West	0.9x	0.77	X	4.8	x	115.77	X	0.63	x	0.7	=	169.83	(80)
West	0.9x	0.77	X	4.16	x	110.22	X	0.63	x	0.7	=	140.13	(80)
West	0.9x	0.77	X	4.8	x	110.22	X	0.63	x	0.7	=	161.68	(80)
West	0.9x	0.77	X	4.16	x	94.68	X	0.63	X	0.7	=	120.37	(80)
West	0.9x	0.77	X	4.8	x	94.68	X	0.63	x	0.7	=	138.88	(80)
West	0.9x	0.77	X	4.16	x	73.59	X	0.63	x	0.7	=	93.56	(80)
West	0.9x	0.77	X	4.8	x	73.59	X	0.63	X	0.7	=	107.95	(80)
West	0.9x	0.77	X	4.16	X	45.59	X	0.63	x	0.7	=	57.96	(80)
West	0.9x	0.77	x	4.8	x	45.59	X	0.63	X	0.7	=	66.88	(80)
West	0.9x	0.77	x	4.16	x	24.49	X	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	X	4.8	X	24.49	Х	0.63	X	0.7		35.92	(80)
West	0.9x	0.77	x	4.16	x	16.15	x	0.63	X	0.7		20.53	(80)
West	0.9x	0.77	x	4.8	х	16.15] x	0.63	x	0.7	_ =	23.69	(80)
							7						
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
Solar g (83)m=						17.01 301.81	Ť			_	44.23		(83)
(83)m=	53.78	105.21 173	3.26		8 3		Ť			_	44.23		(83)
(83)m=	53.78	105.21 173 nternal and s	3.26	252.69 309.6	n + (Ť	.25 201.51		4 67.06	44.23 371.59]	(83) (84)
(83)m= Total g	5 <mark>3.78</mark> ains — ii 389.6	105.21 173 nternal and s 439.23 496	3.26 solar 5.88	$\begin{array}{c c} 252.69 & 309.6 \\ \hline (84)m = (73)i \end{array}$	n + (83)m , watts	259	.25 201.51	124.8	4 67.06]	` ,
(83)m= Total g (84)m= 7. Mea	53.78 ains — ii 389.6 an inter	105.21 173 nternal and s 439.23 496 nal tempera	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seas	n + (on)	83)m , watts	259 527	.88 478.6	124.8	4 67.06		21	` ,
Total g (84)m= 7. Mea	53.78 ains — ir 389.6 an inter erature	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seas	08 3 m + (05 8 on)	83)m , watts 91.2 565.38 area from Ta	259 527	.88 478.6	124.8	4 67.06		21	(84)
Total g (84)m= 7. Mea	53.78 ains — ir 389.6 an inter erature	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seaseriods in the I	00 (some state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of	83)m , watts 91.2 565.38 area from Ta	527 ble 9	.88 478.6	124.8	4 67.06 3 380.21		21	(84)
Total g (84)m= 7. Mea	53.78 ains – ir 389.6 an inter erature tion fac	105.21 173 nternal and s 439.23 496 nal tempera during heati tor for gains Feb A	3.26 solar 3.88 ture (ng pe	252.69 309.6 (84)m = (73)n 559.69 600.0 heating seas eriods in the I ving area, h1	m + (05	watts 91.2 565.38 area from Ta ee Table 9a)	527 ble 9	.88 478.6 , Th1 (°C)	124.8	3 380.21 Nov	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1	105.21 173 nternal and s 439.23 496 nal tempera during heatistor for gains Feb N 0.99 0.	solar solar s.88 ture (ng pe for li	252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seaseriods in the I ving area, h1 Apr Ma 0.94 0.83	on) iving ,,m (s	83)m , watts 91.2 565.38 area from Ta ee Table 9a) Jun Jul	259 527 ble 9 0.5	.88 478.6 , Th1 (°C) ug Sep	124.8 418.7	3 380.21 Nov	371.59	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1	105.21 173 nternal and s 439.23 496 nal tempera during heati tor for gains Feb N 0.99 0. I temperatur	solar solar s.88 ture (ng pe for li	252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seaseriods in the I ving area, h1 Apr Ma 0.94 0.83	on) iving ,,m (s	83)m , watts 991.2 565.38 area from Ta ee Table 9a) Jun Jul 0.65 0.48	259 527 ble 9 0.5	.25 201.51 .88 478.6 .7h1 (°C) .89 .79 .79 .79 .79 .79 .79 .79 .79 .79 .79 .79 .79 .79 .70 .79 .70 .79 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .70 .	124.8 418.7	4 67.06 3 380.21 . Nov 0.99	371.59	21	(84)
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	9.04 (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 the utilisation factor for gains using Table 9a	e-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains, hm:	500
(94)m= 0.99 0.99 0.97 0.91 0.79 0.6 0.43 0.48 0.75 0.94 0.99	.99 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	9.48 (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	1.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 955.18 926.41 842.45 707.2 546.66 367.27 242.68 254.72 396.54 596.52 788.88 9	1.45 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
Total per year (kWh/year) = Sum(98)-	912 = 2097.63 (98)
Space heating requirement in kWh/m²/year	38.07 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1 (204)
Efficiency of main space heating system 1	93.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec kWh/year
Space heating requirement (calculated above)	
422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
	3.09
Total (kWh/year) =Sum(211) _{15,1012} =	2243.46 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)]} x 100 ÷ (208)	
(215)m= 0 0 0 0 0 0 0 0 0 0 0	0
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)
Water heating	
Output from water heater (calculated above)	
	9.67
Efficiency of water heater	79.8 (216)
	7.21 (217)
Fuel for water heating, kWh/month	
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 199.41 176.5 187.19 171.23 172.91 160.26 154.53 168.72 168.15 177.37 183.21 172.91 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183$	4.56
Total = Sum(219a) ₁₁₂ =	2114.03 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	- NVVII/y Cai
opace ricating faci asca, main system i	2243.46

					_
Water heating fuel used				2114.03	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				262.71	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4695.2	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	484.59	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	456.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			941.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	136.34	(268)
Total CO2, kg/year TER =	sum	n of (265)(271) =		20.26	(272)

SAP Input

Property Details: Sample 4 (Top)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height:

Floor 0 67 m^2 3 m

Living area: 27.3 m² (fraction 0.407)

Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
DOO	R	<u>Manufacturer</u>	Solid			W <mark>ood</mark>
W		<u>Manufacturer</u>	Windows	low-E, $En = 0.05$, s	<mark>soft</mark> coat No	
S		Manufacturer	Windows	low-E, En = 0.05 , s	soft coat No	
Balco	ony	Manufactur <mark>e</mark> r	Windows	low-E, $En = 0.05$, s	<mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	1.44	1
S		0.7	0.4	1	5.44	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
S		S	South	0	0
Balcony		S	South	0	0

Overshading: More than average

Opaque Elements:

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elem	<u>ients</u>						
S	31.7	10.24	21.46	0.15	0	False	N/A
W	19	1.44	17.56	0.15	0	False	N/A
INT	11.1	2.4	8.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Roof	67	0	67	0.11	0		N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 4 (Top))			
Address :											
1. Overall dwelling dime	ensions:			Aro	a(m²)		Av. Ho	ight(m)		Volume(m	3)
Ground floor				Ale	• ,	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)-	+(1d)+(1e	e)+(1r	٦)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	ry +	other 0	7 = [total 0	x	40 =	m³ per hou	ır — _(6a)
Number of open flues	0	╡ + ト	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa						J		x	10 =		(7a)
						Ļ	0		10 =	0	╡`´
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	ires					L	0	X 4	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimne	eys, flues and	fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l			ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	he dw <mark>elling</mark> (r	ns)						1(0)	41.04	0	(9)
Structural infiltration: 0) 25 for stool (ar timbar	frome or	. 0. 25 fo	r maaani	n, constr	ruotion	[(9)	-1]x0.1 =	0	= (10)
if both types of wall are p						•	uction			0	(11)
deducting areas of openi	ings); if equal use	er 0.35		-		·					_
If suspended wooden		•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window Window infiltration	s and doors o	iraugnt st	rippea		0.25 - [0.2	2 x (14) ÷ 1	001 -			0	(14)
Infiltration rate					•	+ (11) + (1	-	+ (15) =		0	(15)
Air permeability value,	a50 express	ed in cub	ic metre	s per ho					area	3	(10)
If based on air permeabi				•	•	•			G	0.15	(18)
Air permeability value applie	•						is being us	sed			` ′
Number of sides sheltered	ed									2	(19)
Shelter factor					` ,	[0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified		'		Ι.	Ι.	T _	T -	T .	T _	1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp	-			1	1	1	1	1	1	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (2	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]	

djusted infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				•	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
<i>Calculate effec</i> If mechanica		•	rate for t	пе аррп	саріе са	se						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)		`
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (23b)	•	•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho				•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v					•				0.5]			-	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss	paramete	er:							_	_	
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
)oors					2.4	х	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				1.44	x	1/[1/(1)+	0.04] =	1.38				(27
Vindows Type	2				5.44	X	1/[1/(1)+	0.04] =	5.23				(27
Vindows Type	3				4.8	Х	1/[1/(1)+	0.04] =	4.62				(27
Valls Type1	31.	7	10.24	4	21.46	S X	0.15	= [3.22				(29
Valls Type2	19		1.44		17.56	X	0.15	= [2.63				(29
Valls Type3	11.	1	2.4		8.7	X	0.15	= [1.3				(29
Valls Type4	2.4	,	0		2.4	X	0.35	= [0.84				(29
Roof	67	,	0		67	X	0.11	= [7.37				(30
otal area of el	ements	, m²			131.2	2							(3
for windows and i * include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
abric heat los				o ana par	1110110		(26)(30)) + (32) =				29.96	(33
leat capacity (•	- /					((28)	(30) + (32	2) + (32a).	(32e) =	1304.6	
hermal mass			P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assessi an be used instea				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						19.68	(30
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			49.64	(3
entilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		

								1			I	(2.2)
` '	52 17.31		16.04	14.98	14.98	14.77	15.41	16.04	16.46	16.89		(38)
Heat transfer coeff	 _		1	T	T	T	- ` 	= (37) + (T	I	
(39)m= 67.37 67	16 66.94	65.89	65.68	64.62	64.62	64.41	65.04	65.68	66.1	66.52	65.02	(39)
Heat loss paramet	er (HLP), \	N/m²K						= (39)m ÷	Sum(39) ₁ - (4)	12 / 1 Z=	65.83	(39)
(40)m= 1.01	1	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.99	0.99		_
Number of days in	month (Ta	able 1a)					,	Average =	Sum(40)₁	12 /12=	0.98	(40)
	eb Mai		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	8 31	30	31	30	31	31	30	31	30	31		(41)
L .	!		•				l				J	
4. Water heating	energy rec	uirement:								kWh/ye	ear:	
Assumed secures	ov. N										ı	(40)
Assumed occupar if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76	x [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.17		(42)
Annual average h		age in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		85	5.76	1	(43)
Reduce the annual ave	rage hot wat	er usage by	5% if the c	lwelling is	designed			se target o			1	, ,
not more that 125 litres		7 1			<u>, </u>			0 1				
Jan F Hot water usage in litre	eb Mai		May	Jun	Jul Table 1c x	(43)	Sep	Oct	Nov	Dec		
(44)m= 94.34 90			80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
(44)111= 34.34 30	51 07.40	04.00	00.02	77.15	17.15	00.02			m(44) ₁₁₂ :		1029.18	(44)
Energy content of hot w	vater used - d	ca <mark>lculate</mark> d m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			` '			` ′
(45)m= 139.91 122	.36 126.2	7 110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If instantaneous water	hooting of no	int of upo (n	o hot wata	r otorogo)	ontor O in	hoves (46		Total = Su	m(45) ₁₁₂ :	=	1349.41	(45)
		<u> </u>	1		1	· ·	. , ,	47.45	10.70	00.00	1	(46)
(46)m= 20.99 18 Water storage loss	35 18.94 :	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volume (li	res) includ	ding any s	olar or V	WHRS	storage	within sa	ame ves	sel		0		(47)
If community heati	ng and no	tank in dv	velling, e	enter 110) litres in	(47)					1	
Otherwise if no sto		ater (this i	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
Water storage loss a) If manufacturer		d loss fact	or is kno	wn (kWł	n/day).					0		(48)
Temperature factor			000	(.,, , .					0		(49)
Energy lost from w			ear			(48) x (49)) =			10		(50)
b) If manufacturer	's declared	d cylinder	loss fact									, ,
Hot water storage			le 2 (kW	h/litre/da	ay)				0	.02		(51)
If community heati Volume factor fron	•	JUON 4.3							1	.03		(52)
Temperature factor		le 2b							-).6		(53)
Energy lost from w	ater storaç	ge, kWh/y	ear			(47) x (51)) x (52) x (53) =	1	.03		(54)
Enter (50) or (54)	in (55)								1	.03		(55)
Water storage loss	calculated	d for each	month			((56)m = (55) × (41)	m				
` '	92 32.01		32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dec	icated solar s	storage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	60), else (5	7)m = (56)	m where (H11) is fro	om Append	ix H	
(57)m= 32.01 28	92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fro	om Table 3						0		(58)
Primary circuit loss calculated f	for each month (59)m = (58)	÷ 365 × (41)	m				•	
(modified by factor from Tab	le H5 if there is	solar water h	neating and a	cylinder	thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23	3.26 23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each	month (61)m =	(60) ÷ 365 ×	د (41)m						
(61)m= 0 0 0	0 0	0	0 0	0	0	0	0		(61)
Total heat required for water he	eating calculated	for each m	onth (62)m =	: 0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.18 172.29 181.54	163.58 160.9	144.64 13	9.74 152.2	151.57	169.58	178.26	190.77		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative qu	uantity) (enter '0	if no solar	contribut	ion to wate	r heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, se	e Appendix (3)					
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 18.03 16.04 16.49	14.58 14.03	12.18 11	1.28 12.94	13.08	15.09	16.32	17.54		(63) (G2
Output from water heater									
(64)m= 174.47 153.83 162.37	146.4 144.19	129.86 12	5.78 136.58	135.89	151.81	159.35	170.55		_
			Out	out from wa	ater heate	r (annual) ₁	12	1791.08	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (4	45)m + (61)n	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.74 80.63 86.21	79.4 79.34	73.1 72	2.31 76.45	75.41	82.23	84.28	89.27		(65)
include (57)m in calculation of	of (65)m only if c	ylinder is in	the dwelling	or hot wa	ate <mark>r is</mark> fr	om com	munity h	eating	
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	ts								
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56 10	8.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	opendix L, equat	ion L9 or L9	a), also see	Table 5					
(67)m= 17.86 15.86 12.9	9.77 7.3	6.16 6	.66 8.66	11.62	14.75	17.22	18.36		(67)
Appliances gains (calculated in	n Appendix L, eq	uation L13 o	or L13a), also	see Tal	ole 5	-			
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 14	2.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	ppendix L, equa	tion L15 or L	_15a), also s	ee Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86 33	33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	5a)		=	-		-			
(70)m= 0 0 0	0 0	0	0 0	0	0	0	0		(70)
Losses e.g. evaporation (negative	tive values) (Tab	ole 5)	•	•				•	
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -8	6.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)		-						•	
(72)m= 121.96 119.98 115.87	110.27 106.64	101.53 97	7.18 102.75	104.73	110.52	117.06	119.99		(72)
Total internal gains =		(66)m +	(67)m + (68)m	+ (69)m + (70)m + (7	1)m + (72)	m	•	
(73)m= 385.59 383.58 371.53	352.22 332.75	313.94 30	01.7 307.29	317.21	336.72	359.09	375.72		(73)
6. Solar gains:			·						
Solar gains are calculated using solar	r flux from Table 6a	and associated	l equations to co	onvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table (6a T	g_ able 6b	Т	FF able 6c		Gains (W)	
O a vith					T x Г			· ,	(78)
South 0.9x 0.77 x	5.44	X 46.75	<u> </u>	0.4	」 ^ L	0.7	=	49.35	J(10)

	-					_				_ ,				_
South	0.9x	0.77	X	4.8		x	46.75	X	0.4	X	0.7	=	43.54	(78)
South	0.9x	0.77	X	5.44		×	76.57	X	0.4	X	0.7	=	80.82	(78)
South	0.9x	0.77	X	4.8		x	76.57	X	0.4	x	0.7	=	71.31	(78)
South	0.9x	0.77	X	5.44		X	97.53	X	0.4	X	0.7	=	102.95	(78)
South	0.9x	0.77	X	4.8		x	97.53	X	0.4	X	0.7	=	90.84	(78)
South	0.9x	0.77	X	5.44		x	110.23	X	0.4	X	0.7	=	116.36	(78)
South	0.9x	0.77	X	4.8		x	110.23	X	0.4	x	0.7	=	102.67	(78)
South	0.9x	0.77	X	5.44		x	114.87	X	0.4	X	0.7	=	121.26	(78)
South	0.9x	0.77	X	4.8		x	114.87	X	0.4	X	0.7	=	106.99	(78)
South	0.9x	0.77	X	5.44		x	110.55	X	0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77	X	4.8		x	110.55	x	0.4	x	0.7	=	102.96	(78)
South	0.9x	0.77	X	5.44		x	108.01	x	0.4	x	0.7	=	114.01	(78)
South	0.9x	0.77	X	4.8		x	108.01	X	0.4	x	0.7	=	100.6	(78)
South	0.9x	0.77	X	5.44		x	104.89	x	0.4	x	0.7	=	110.72	(78)
South	0.9x	0.77	x	4.8		x	104.89	x	0.4	x	0.7	=	97.7	(78)
South	0.9x	0.77	x	5.44		x	101.89	x	0.4	x	0.7	=	107.55	(78)
South	0.9x	0.77	x	4.8		x [101.89	x	0.4	x	0.7	=	94.9	(78)
South	0.9x	0.77	x	5.44		x [82.59	Х	0.4	Х	0.7	=	87.18	(78)
South	0.9x	0.77	×	4.8	=	x	82.59	х	0.4	х	0.7	=	76.92	(78)
South	0.9x	0.77	×	5.44		х	55.42	×	0.4	х	0.7	=	58.5	(78)
South	0.9x	0.77	x	4.8		x	55.42	x	0.4	х	0.7	=	51.62	(78)
South	0.9x	0.77	×	5.44		x [40.4	х	0.4	x	0.7	-	42.64	(78)
South	0.9x	0.77	X	4.8	7	x	40.4	X	0.4	х	0.7	=	37.63	(78)
West	0.9x	0.77	x	1.44	1	х	19.64	x	0.4	х	0.7	=	5.49	(80)
West	0.9x	0.77	×	1.44		х	38.42	x	0.4	x	0.7	=	10.74	(80)
West	0.9x	0.77	x	1.44		x	63.27	x	0.4	x	0.7		17.68	(80)
West	0.9x	0.77	X	1.44		x	92.28	x	0.4	x	0.7	=	25.78	(80)
West	0.9x	0.77	x	1.44		x	113.09	x	0.4	×	0.7		31.6	(80)
West	0.9x	0.77	x	1.44		x	115.77	x	0.4	x	0.7		32.35	(80)
West	0.9x	0.77	x	1.44		x	110.22	x	0.4	x	0.7	=	30.8	(80)
West	0.9x	0.77	x	1.44		x	94.68	x	0.4	x	0.7	=	26.45	(80)
West	0.9x	0.77	x	1.44		х	73.59	x	0.4	x	0.7	=	20.56	(80)
West	0.9x	0.77	x	1.44		x [45.59	x	0.4	x	0.7	=	12.74	(80)
West	0.9x	0.77	×	1.44		x [24.49	x	0.4	×	0.7	_ =	6.84	(80)
West	0.9x	0.77	×	1.44		х	16.15	x	0.4	×	0.7		4.51	(80)
						_		•						
Solar g	ains in	watts, cal	culated	for each	month			(83)m	ı = Sum(74)m	(82)m				
(83)m=	98.38	162.87	211.48	244.82	259.85	2	245.41	234	.88 223.01	176.83	116.95	84.78		(83)
Total ga	ains – i	nternal an	d solar	(84)m =	(73)m ·	+ (8	3)m , watts							
(84)m=	483.97	546.46	583.01	597.03	592.6	56	5.95 547.11	542	.17 540.21	513.55	476.04	460.5		(84)
7. Mea	an inter	nal tempe	erature	(heating s	season)								
							area from Tab	ole 9	Th1 (°C)				21	(85)
•		•	٠.			-	e Table 9a)							
ſ	Jan	Feb	Mar	Apr	May	È	Jun Jul	А	ug Sep	Oct	Nov	Dec		
01	OAD 004	12 Varaian: 1	0.5.54 /	-	In 11 11	•		•		•		•		5 of 7

(86)m= 0.99 0.99 0.98 0.94 0.86 0.69 0.51 0.54 0.76 0.94 0.99 1]	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.07 20.22 20.42 20.66 20.86 20.97 21 20.99 20.95 20.71 20.35 20.05]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.08 20.08 20.08 20.1 20.1 20.11 20.11 20.12 20.11 20.1 20.]	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.99 0.99 0.97 0.92 0.82 0.61 0.41 0.44 0.69 0.92 0.98 0.99]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_	
(90)m= 18.85 19.07 19.36 19.7 19.96 20.09 20.11 20.11 20.07 19.78 19.27 18.82		(90)
$fLA = Living area \div (4) =$	0.41	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	_	
(92)m= 19.35 19.54 19.79 20.09 20.33 20.45 20.47 20.47 20.43 20.16 19.71 19.32]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1	(00)
(93)m= 19.35 19.54 19.79 20.09 20.33 20.45 20.47 20.47 20.43 20.16 19.71 19.32 8. Space heating requirement		(93)
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	Jaiato	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:	1	(0.4)
(94)m= 0.99 0.98 0.97 0.92 0.83 0.65 0.45 0.48 0.72 0.92 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m (95)m= 479.93 537.31 563.24 552.12 492.69 365.13 248.72 260.28 387.24 473.6 467.42 457.5	1	(95)
Monthly average external temperature from Table 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 for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	-	
(97)m= 1013.82 982.98 889.74 737.57 566.46 378.05 250.18 262.28 411.46 627.84 833.51 1006]	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 397.22 299.49 242.92 133.53 54.89 0 0 0 114.75 263.58 408.09	1	
Total per year (kWh/year) = Sum(98) _{15,912}	1914.46	(98)
Space heating requirement in kWh/m²/year](99)
	28.57](99)
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources;	the latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		7
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 heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	_
Annual space heating requirement	1914.46]

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2010.19	(307a)
Efficiency of secondary/supplementary heating system in % (fror		0](308
Space heating requirement from secondary/supplementary syste		0] (309)
			J` ′
Water heating Annual water heating requirement		1791.08	1
If DHW from community scheme:	(0.1) (000) (005) (000)		J
Water heat from Community heat pump	$(64) \times (303a) \times (305) \times (306) =$	1880.63	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =		(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from a	putside	119.54	(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) =	119.54	(331)
Energy for lighting (calculated in Appendix L)		315.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (332)(237b) =	3807.64	(338)
12b. CO2 Emissions – Community heating scheme			
		r Emiss <mark>ions</mark> kg CO2/vear	
CO2 from other sources of space and water heating (not CHP)	kWh/year kg CO2/kWh	r 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		kg CO2/year](367a)
Efficiency of heat source 1 (%) If there is CHP using	kWh/year kg CO2/kWh	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(307b)+(307b)]	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for	kg CO2/year	
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel 256 = 788.8	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems (307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(3	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x (313) x (363)(366) + (368)(372) (309) x (309) x	kg CO2/year uel	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f 310b)] x 100 ÷ (367b) x 0.52 313) x 0.52 363)(366) + (368)(372) 309) x 0 ous heater (312) x 0.22	kg CO2/year uel](367)](372)](373)](374)](375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the secon	kg CO2/year uel](367)](372)](373)](374)](375)](376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/kWh two fuels repeat (863) to (366) for the second f 310b)] x 100 ÷ (367b) x 0.52 313) x 0.52 363)(366) + (368)(372) 309) x 0 0 0 0 0 0 1 1 1 1 1 1 1	kg CO2/year uel](367)](372)](373)](374)](375)](376)](378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantanee Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwellin CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applications.	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 (0us heater (312) x 0.22 (373) + (374) + (375) = (19 (331)) x 0.52 (332))) x 0.52	kg CO2/year uel	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 (0us heater (312) x 0.22 (373) + (374) + (375) = (19 (331)) x 0.52 (332))) x 0.52	kg CO2/year uel	(367) (372) (373) (374) (375) (376) (378) (379) (380)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneed Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application 1 Total CO2, kg/year sum of (376)(382) =	kWh/year kg CO2/kWh two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52 (313) x 0.52 (363)(366) + (368)(372) (309) x 0 (0us heater (312) x 0.22 (373) + (374) + (375) = (19 (331)) x 0.52 (332))) x 0.52	kg CO2/year uel](367)](372)](373)](374)](375)](376)](378)](379)](380)](383)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 4 (Top) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x (2a) =(3a) 67 3 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) other total main secondary m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) 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) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (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

		<u> </u>				i ´	(21a) x	` ´	0.00	0.00		1	
0.38 alculate effec	0.37 ctive air	0.36 change	0.33 rate for t	0.32 he appli	0.28	0.28 ISE	0.27	0.3	0.32	0.33	0.35		
If mechanica		•										0	
If exhaust air he	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	
If balanced with	heat reco	overy: effic	ciency in %	allowing	for in-use f	actor (fron	n Table 4h) =				0	
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
la)m= 0	0	0	0	0	0	0	0	0	0	0	0		
b) If balance	d mech	anical ve	entilation	without	heat red	covery (l	MV) (24b)m = (22	2b)m + (2	23b)		_	
1b)m= 0	0	0	0	0	0	0	0	0	0	0	0		
c) If whole h if (22b)m				•	-				.5 × (23b	o)			
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0		
d) If natural if (22b)m									0.5]			_	
ld)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]	
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)				_	
5)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		
. Heat losses	s and he	eat loss	paramete	er:							_	_	
LEMENT	Gros		Openin		Net Ar	rea	U-val	ue	AXU		k-value	Э	ΑXk
	area	(m ²)	· m	2	A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-	K	kJ/K
oors					2.4	X	1	=	2.4				
indows Type					1.44	x1	/[1/(1.4)+	0.04] =	1.91	Ц			
indows Type	2				5.44	x1	/[1/(1.4)+	0.04] =	7.21	Ц			
indows Type	3				4.8	x1	/[1/(1.4)+	0.04] =	6.36				
alls Type1	31.	7	10.2	4	21.46	3 X	0.18	=	3.86				
alls Type2	19		1.44		17.56	5 x	0.18	=	3.16				
alls Type3	11.	1	2.4		8.7	X	0.18	=	1.57				
alls Type4	2.4	ļ	0		2.4	X	0.18	=	0.43	\Box [
oof	67	,	0		67	X	0.13	=	8.71				
tal area of e	lements	, m²			131.2	2							
or windows and include the area						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragrapl	3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				35.0	62
eat capacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	1304	1.68
ermal mass	parame	ter (TMI	= Cm ÷	- TFA) iı	n kJ/m²K			Indica	tive Value	Medium		25	0
r design assess n be used instea				construct	tion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
ermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	K						6.5	66
letails of therma Ital fabric hea		are not kr	nown (36) =	= 0.05 x (3	31)			(33) +	(36) =			42.	18
entilation hea	t loss ca	alculated	d monthly	/				(38)m	= 0.33 × (25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

	()									
(38)m= 37.92 37.74 37.56 36.71 36.55 35.81 35.81 35.67 36.09 36.55 36.87 37.21	(38)									
Heat transfer coefficient, W/K (39)m = (37) + (38)m										
(39)m= 80.1 79.91 79.73 78.88 78.72 77.98 77.98 77.85 78.27 78.72 79.05 79.38	(20)									
Average = Sum(39) ₁₁₂ /12= $\frac{78.88}{40}$ Heat loss parameter (HLP), W/m ² K $\frac{40}{10}$ (40)m = $\frac{39}{10}$ m ÷ $\frac{4}{10}$	(39)									
(40)m= 1.2 1.19 1.18 1.17 1.16 1.16 1.16 1.17 1.17 1.18 1.18										
Average = $Sum(40)_{112}/12=$ 1.18 Number of days in month (Table 1a)	(40)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec										
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)									
4. Water heating energy requirement: kWh/year:										
Assumed occupancy, N 2.17	(42)									
if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)									
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)									
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)										
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)										
(44)m= 94.34 90.91 87.48 84.05 80.62 77.19 77.19 80.62 84.05 87.48 90.91 94.34										
Total = Sum(44) ₁₋₁₂ = 1029.1	18 (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= 139.91 122.36 126.27 110.08 105.63 91.15 84.46 96.92 98.08 114.3 124.77 135.49										
Total = Sum(45) ₁₁₂ = 1349.4 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)									
	(46)									
(46)m= 20.99 18.35 18.94 16.51 15.84 13.67 12.67 14.54 14.71 17.15 18.72 20.32 Water storage loss:	(40)									
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)									
If community heating and no tank in dwelling, enter 110 litres in (47)										
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)										
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)									
Temperature factor from Table 2b	(49)									
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$	(50)									
b) If manufacturer's declared cylinder loss factor is not known:	(55)									
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)									
If community heating see section 4.3 Volume factor from Table 2a	(50)									
Temperature factor from Table 2b	(52) (53)									
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)									
Enter (50) or (54) in (55)	(55)									
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,									
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)									
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H										
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)									

Primary circuit loss (annual) fro						(0		(58)
Primary circuit loss calculated for	,	, ,	, , ,		thormo	otot)			
(modified by factor from Table (59)m= 23.26 21.01 23.26	22.51 23.26		23.26 23.26	22.51	23.26	22.51	23.26		(59)
` '			<u> </u>						, ,
Combi loss calculated for each (61)m= 0 0 0	$\frac{\text{month } (61)\text{m} = (61)\text{m}}{0} = (61)\text{m}$	60) ÷ 365	× (41)m	0	0	0	0		(61)
Total heat required for water he								(F0)m + (G1)m	
(62)m= 186.5 164.45 172.86	155.17 152.22		131.06 143.52	143.17	160.9	169.86	182.09	(59)111 + (61)111	(62)
Solar DHW input calculated using Appe			!						(02)
(add additional lines if FGHRS					Contributi	on to wate	i ricating)		
(63)m= 0 0 0	0 0	0	0 0	0	0	0	0		(63)
FHRS 0 0 0	0 0	0	0 0	0	0	0	0		(63) (G2
Output from water heater									
(64)m= 186.5 164.45 172.86	155.17 152.22	136.24 1	131.06 143.52	143.17	160.9	169.86	182.09		
			Outp	out from wa	iter heater	(annual) _{1.}	12	1898.03	(64)
Heat gains from water heating,	kWh/month 0.25	5 ´ [0.85 ×	(45)m + (61)m	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	_
(65)m= 83.79 74.35 79.26	72.68 72.4	-	65.36 69.5	68.68	75.28	77.56	82.33	-	(65)
include (57)m in calculation of	of (65)m only if cy	/linder is i	n the dwelling	or hot wa	ater is fr	om com	munity h	eating	
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), Watt									
Jan Feb Mar	Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec		
(66)m= 108.56 108.56 108.56	108.56 108.56	108.56	108.56 108.56	108.56	108.56	108.56	108.56		(66)
Lighting gains (calculated in Ap	pendix L, equation	on L9 or L	9a), also see	Table 5					
(67)m= 17.41 15.46 12.58	9.52 7.12	6.01	6.49 8.44	11.33	14.38	16.79	17.89		(67)
Appliances gains (calculated in	Appendix L, equ	uation L13	or L13a), also	see Tab	ole 5				
(68)m= 190.2 192.17 187.2	176.61 163.24	150.68 1	142.29 140.32	145.29	155.88	169.24	181.8		(68)
Cooking gains (calculated in Ap	pendix L, equati	on L15 or	· L15a), also se	ee Table	5				
(69)m= 33.86 33.86 33.86	33.86 33.86	33.86	33.86 33.86	33.86	33.86	33.86	33.86		(69)
Pumps and fans gains (Table 5	ia)	•	•	•					
(70)m= 3 3 3	3 3	3	3 3	3	3	3	3		(70)
Losses e.g. evaporation (negat	ive values) (Tabl	e 5)	•	•					
(71)m= -86.85 -86.85 -86.85	-86.85 -86.85	-86.85 -	-86.85 -86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water heating gains (Table 5)	-	-	-						
(72)m= 112.63 110.65 106.53	100.94 97.31	92.19	87.85 93.42	95.4	101.18	107.72	110.65		(72)
Total internal gains =		(66)m	+ (67)m + (68)m -	+ (69)m + (7	70)m + (7	1)m + (72)	m		
(73)m= 378.8 376.85 364.87	345.64 326.23	307.45	295.2 300.74	310.58	330.01	352.32	368.92		(73)
6. Solar gains:									
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.									
Orientation: Access Factor Table 6d	Area m²	Flux Table	e 6a T	g_ able 6b	Ta	FF able 6c		Gains (W)	
South 0.9x 0.77 x	5.44	x 46.7	75 X	0.63	_ x _	0.7	=	77.73	(78)

	_					_		_						
South	0.9x	0.77		X	4.8	X	46.75	×	0.63	X	0.7	=	68.58	(78)
South	0.9x	0.77		X	5.44	X	76.57	X	0.63	X	0.7	=	127.3	(78)
South	0.9x	0.77		X	4.8	X	76.57	X	0.63	X	0.7	=	112.32	(78)
South	0.9x	0.77		x	5.44	x	97.53	X	0.63	X	0.7	=	162.15	(78)
South	0.9x	0.77		x	4.8	x	97.53	×	0.63	x	0.7	=	143.08	(78)
South	0.9x	0.77		x	5.44	x	110.23	X	0.63	x	0.7	=	183.27	(78)
South	0.9x	0.77		x	4.8	x	110.23	X	0.63	X	0.7	=	161.71	(78)
South	0.9x	0.77		X	5.44	X	114.87	×	0.63	X	0.7	=	190.98	(78)
South	0.9x	0.77		X	4.8	X	114.87	X	0.63	X	0.7	=	168.51	(78)
South	0.9x	0.77		X	5.44	x	110.55	×	0.63	x	0.7	=	183.79	(78)
South	0.9x	0.77		x	4.8	x	110.55	×	0.63	×	0.7	=	162.17	(78)
South	0.9x	0.77		X	5.44	X	108.01	X	0.63	X	0.7	=	179.57	(78)
South	0.9x	0.77		x	4.8	x	108.01	×	0.63	x	0.7	=	158.45	(78)
South	0.9x	0.77		x	5.44	X	104.89	X	0.63	x	0.7	=	174.39	(78)
South	0.9x	0.77		x	4.8	x	104.89	X	0.63	x	0.7	=	153.87	(78)
South	0.9x	0.77		x	5.44	x	101.89	×	0.63	x	0.7	=	169.39	(78)
South	0.9x	0.77		x	4.8	x	101.89	×	0.63	x [0.7	=	149.46	(78)
South	0.9x	0.77		X	5.44	X	82.59	×	0.63	Х	0.7	=	137.3	(78)
South	0.9x	0.77		x	4.8	х	82.59	x	0.63	х	0.7	=	121.15	(78)
South	0.9x	0.77		x	5.44	х	55.42] ×	0.63	х	0.7	=	92.13	(78)
South	0.9x	0.77		x	4.8	x	55.42	x	0.63	х	0.7	=	81.29	(78)
South	0.9x	0.77		x	5.44	x	40.4	X	0.63	х	0.7	=	67.16	(78)
South	0.9x	0.77		x	4.8	x	40.4	X	0.63	х	0.7	=	59.26	(78)
West	0.9x	0.77		x	1.44	x	19.64	X	0.63	х	0.7	=	8.64	(80)
West	0.9x	0.77		x	1.44	x	38.42	X	0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77		x	1.44	x	63.27	X	0.63	X	0.7	=	27.85	(80)
West	0.9x	0.77		x	1.44	x	92.28	X	0.63	×	0.7	=	40.61	(80)
West	0.9x	0.77		x	1.44	x	113.09	X	0.63	x	0.7	=	49.77	(80)
West	0.9x	0.77		x	1.44	x	115.77	X	0.63	x	0.7	=	50.95	(80)
West	0.9x	0.77		x	1.44	x	110.22	X	0.63	×	0.7	=	48.51	(80)
West	0.9x	0.77		x	1.44	x	94.68	×	0.63	x	0.7	=	41.67	(80)
West	0.9x	0.77		x	1.44	x	73.59	×	0.63	x	0.7	=	32.39	(80)
West	0.9x	0.77		x	1.44	x	45.59	×	0.63	x	0.7	=	20.06	(80)
West	0.9x	0.77		x	1.44	x	24.49	X	0.63	x [0.7	=	10.78	(80)
West	0.9x	0.77		x	1.44	x	16.15	×	0.63	x	0.7	=	7.11	(80)
Ť				$\overline{}$	for each mon			_	n = Sum(74)m				Ī	
` ′ L	154.95	256.53	333.0		385.59 409.2		96.91 386.53	369	.93 351.23	278.51	184.2	133.53		(83)
т					$\frac{(84)m = (73)r}{734.00}$	<u> </u>		1	a a	l aaa -		F.c. :-	Ī	(0.4)
(84)m=	533.75	633.37	697.	95	731.22 735.4	9 7	04.36 681.72	670	.67 661.81	608.52	536.52	502.45		(84)
	7. Mean internal temperature (heating season)													
-		_			eriods in the li	_			, Th1 (°C)				21	(85)
Utilisat				$\overline{}$	ving area, h1	Ť			<u> </u>	1	1	1	1	
L	Jan	Feb	Ma	ar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
04	0 4 D 004	0.1/	405	-4 (0	AD 0.02) http://	/							D	5 of 7

						•					•	•	ı	
(86)m=	0.99	0.98	0.96	0.92	0.83	0.67	0.49	0.52	0.74	0.93	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.88	20.08	20.33	20.61	20.83	20.96	20.99	20.99	20.93	20.65	20.2	19.84		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.92	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.94	19.93		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling,	h2,m (se	e Table	9a)					'	
(89)m=	0.99	0.98	0.95	0.9	0.78	0.57	0.38	0.41	0.65	0.9	0.98	0.99		(89)
Mean	interna	l temner	ature in	the rest	of dwelli	na T2 (fa	allow ste	ns 3 to	7 in Tabl	e 9c)			l	
(90)m=	18.45	18.74	19.1	19.5	19.78	19.92	19.95	19.95	19.89	19.56	18.94	18.4		(90)
` ,									f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Moon	intorno	ltompor	oturo (fo	r tha wh	مام طبیره	llina\ fl	Λ., Τ1	. /4 fl	Λ) Το					
(92)m=	19.03	19.29	ature (fo	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(92)
									ere appro		10.40	10.00		(5-)
(93)m=	19.03	19.29	19.6	19.95	20.21	20.34	20.37	20.37	20.32	20	19.45	18.99		(93)
	ace hea	ting requ	uirement											
•		•			e obtain	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm											(0.4)
(94)m=	0.99	0.97	0.95	0.9	0.79	0.61	0.43	0.46	0.68	0.9	0.98	0.99		(94)
(95)m=		617,4	W = (94)	4)M X (84 654.69	581.4	429.59	291.61	305.62	453.17	548.67	523.48	497.96		(95)
			rnal tem				291.01	303.02	455.17	340.07	323.40	497.90		(33)
(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)
									L – (96)m					, ,
	1180.11		1044.63	871.6	669.77	447.95	294.18	309.17	486.44	740.03	976.5	1173.88		(97)
Space	e heatin	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=	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2320.89	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								34.64	(99)
9a. En	erav rec	ıuiremer	nts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	CHP)					
	e heatir					,	3		,,,,					
•		_	at from se	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	-	•	ry/supple			a svstem	າ. %						0	(208)
	•							۸۰۰۵	Con	Oct	Nov	Doo		`
Snac	Jan e heatin	Feb a require	Mar ement (c	Apr alculate	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	yeai
Opaci	485.48	357.69	284.37	156.17	65.75	0	0	0	0	142.37	326.17	502.88		
(211)m			(4)] } x 1						-					(211)
(411)11	519.24	382.55	304.14	167.03	70.32	0	0	0	0	152.27	348.85	537.84		(211)
	·	300	I	31.00					l (kWh/yea				2482.24	(211)
									•	·	10,1012			` ′

Space heating fuel (secondary), kWh/month									
$= \{[(98)m \times (201)]\} \times 100 \div (208)$									
(215)m= 0 0 0 0 0	0 0		0	0	0	0		_	
		Tota	al (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)	
Water heating									
Output from water heater (calculated above) 186.5 164.45 172.86 155.17 152.22 1	136.24 131.	.06 143.52	143.17	160.9	169.86	182.09			
Efficiency of water heater	130.24 131.	143.52	143.17	160.9	109.00	162.09	70.0	(216)	
	79.8 79.	8 79.8	79.8	84.49	86.53	87.39	79.8	(217)	
` '	79.6 79.	0 79.0	79.0	04.49	00.33	07.39		(217)	
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
	170.73 164	23 179.84	179.41	190.43	196.31	208.37			
	•	Tota	al = Sum(2	19a) ₁₁₂ =			2260.02	(219)	
Annual totals				k\	Wh/year	•	kWh/year	-	
Space heating fuel used, main system 1							2482.24		
Water heating fuel used							2260.02		
Electricity for pumps, fans and electric keep-hot									
central heating pump: 30 (230c)									
boi <mark>ler with a fan-assisted flue</mark>						45		(230e)	
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)	
Electricity for lighting							307.48	(232)	
Total delivered energy for all uses (211)(221) +	(231) + (23	32)(23 7 b)	=				5124.74	(338)	
12a. CO2 emissions – Individual heating system	ns including	micro-CHF	2					<u> </u>	
	kWh/ye			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea		
Space heating (main system 1)	(211) x			0.2	16	=	536.16	(261)	
Space heating (secondary)	(215) x			0.5	19	=	0	(263)	
Water heating	(219) x			0.2	16	=	488.16	(264)	
Space and water heating	(261) + (2	62) + (263) +	(264) =				1024.33	(265)	
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)	
Electricity for lighting	(232) x			0.5	19	=	159.58	(268)	
Total CO2, kg/year			sum o	f (265)(2	271) =		1222.83	(272)	

TER =

(273)

18.25

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 67 m²

Floor 0 3 m

27.5 m² (fraction 0.41) Living area:

Unspecified Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
DOO <mark>R</mark>	Manufacturer	Solid			Wood
E	Manufacturer	Windows	low-E, $En = 0.05$,	soft coat No	
Balcony	Manufacturer	Windows	low-E, En = 0.05 ,	soft coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
Е		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Width: Type-Name: Location: Orient: Height: Name: Worst case **DOOR** INT 0 Ε East 0 0 Balcony Ε East 0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
E	29.4	8.96	20.44	0.15	0	False	N/A
INT	12	2.4	9.6	0.16	0.43	False	N/A
Spandrel	2.44	0	2.44	0.35	0	False	N/A
Roof	67	0	67	0.11	0		N/A
Internal Flements	3						

<u>Internal Elements</u>

Party Elements

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges:

SAP Input

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma	FSAP 201	2			a Num are Vei			Versio	on: 1.0.5.51	
			Р	roperty.	Address	: Sample	e 5 (Top))			
Address :	:										
1. Overall dwelling dime	ensions:			Aro	a(m²)		Av. Ho	ight(m)		Volume(m	3)
Ground floor				Ale	• ,	(1a) x		3	(2a) =	201	(3a)
Total floor area TFA = (1	a)+(1b)+(1	c)+(1d)+(1e	e)+(1r	٦)	67	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	201	(5)
2. Ventilation rate:											
Number of chimneys	mair heati		econdai neating	гу] + [other 0	7 = [total 0	x 4	40 =	m³ per hou	ır — _(6a)
Number of open flues		+ <u> </u>	0	╡╻┝	0	_	0	x	20 =	0	(6b)
Number of intermittent fa		L				J		x	10 =		(7a)
						Ļ	0		10 =	0	╡`´
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas f	rires					L	0	X	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimne	eys, flu <mark>es a</mark> i	nd fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l			ed, procee	d to (17), (otherwise o	continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	he dwelling	j (ns)						[(0)	41.04	0	(9)
Structural infiltration: 0) 25 for sto	al or timbor	frame or	0.35 fo	r macanı	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	uction			0	(11)
deducting areas of openi											_
If suspended wooden		•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er			له م ماند،							0	(13)
Percentage of window Window infiltration	s and door	s draught si	nppea		0 25 - [0 2	2 x (14) ÷ 1	001 =			0	(14)
Infiltration rate					•	+ (11) + (1	•	+ (15) =		0	(15)
Air permeability value,	a50. expre	essed in cub	ic metre	es per ho	. , , ,	. , ,	, , ,		area	3	(17)
If based on air permeabi				•	•	•			G	0.15	(18)
Air permeability value applie	•						is being us	sed			` ′
Number of sides sheltered	ed									3	(19)
Shelter factor					` ,	[0.075 x (1	[9)] =			0.78	(20)
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified		- i	1	Ι.	Ι.	T _	T -	Ι.	T _	1	
Jan Feb		pr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				1	1	1	1	1	1	1	
(22)m= 5.1 5	4.9 4.	4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	

0.15	0.15	0.14	0.13	0.12	0.11	0.11	(21a) x	0.12	0.12	0.13	0.14]	
alculate effec		change i		_	i -	l -					1		
If mechanica	ıl ventila	ition:										0.5	(2
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		-	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	itilation o	or positiv	e input v	ventilatio	n from o	outside					
if (22b)m	1 < 0.5 ×	(23b), t	hen (24d	c) = (23b	o); other	wise (24	c) = (22k	o) m + 0.	5 × (23b)	r	1	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural									o =1				
if (22b)m		`	<u> </u>		r `						1 .	1	(6
1d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	<u> </u>	í `	´``		`			1	1	
i)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
. Heat losses	and he	eat loss	paramete	er:									
_EMENT	Gros	SS	Openin	gs	Net Ar	ea	U-val		AXU		k-value	Э	ΑΧk
	area	(m²)	· m	12	A ,r	n²	W/m2	!K	(W/I	K)	kJ/m²-l	K	kJ/K
ors					2.4	Х	1.4	=	3.36				(2
in <mark>dows</mark> Type	1				4.16	x	1/[1/(1)+	0.04] =	4				(2
indows Type	2				4.8	X	1/[1/(1)+	0.04] =	4.62	П			(2
alls Type1	29.4	4	8.96		20.44	X	0.15] =	3.07	٦ ſ		7 6	(2
alls Type2	12		2.4		9.6	x	0.15	-	1.44	i i		7 F	(2
alls Type3	2.4	4	0		2.44	x	0.35	=	0.85	=		i i	(2
oof	67		0	=	67	x	0.11	_	7.37	=		╡	(3
tal area of e						_	0.11		1.31				
			effootivo wi	ndow I I v	110.8		formula 1	/F/1/II val	(0) (0 (04) (no airen in	norogrank		(3
or windows and Include the area						ateu using	i ioiiiiuia i	/[(1/ U- vait	1 0)+0.04] a	is giveri iri	i paragrapi	1 3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				24.7	(3
at capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	1057.7	
ermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(;
r design assess	-						ecisely the	e indicative	values of	TMP in T	able 1f		`
n be used instea	ad of a de	tailed calc	ulation.										
ermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						16.63	(3
etails of therma		are not kn	own (36) =	= 0.05 x (3	11)								
tal fabric he									(36) =			41.33	(3
ntilation hea		i			ı	<u> </u>			= 0.33 × (25)m x (5	1	1	
1 1	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan					1 44 27	14.27	14.08	14.66	15.24	15.62	16.01	Ī	10
)m= 16.78	16.59	16.39	15.43	15.24	14.27	14.21	14.06	14.00	15.24	13.02	10.01		(3
_		<u> </u>	15.43	15.24	14.27	14.21	14.00	<u> </u>	= (37) + (37)	<u> </u>	10.01		(.

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.83	0.84	0.84	0.85	0.86		
	!					!			Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day	1	1 ` ` 	<u> </u>						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		17		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed i			se target o		5.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x			!				
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
										ım(44) ₁₁₂ =		1029.18	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,ı	m x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		_
If instantaneous w	vater heati	ing at point	of use (no	hot water	storage)	enter () in	hoxes (46		Total = Su	ım(45) ₁₁₂ =		1349.41	(45)
(46)m= 20.99	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Water storage		10.94	10.51	15.04	13.07	12.07	14.54	14.71	17.13	10.72	20.32		(40)
Storage volum	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		الممسمام	ft-	ممادة	/1.\^/1	- /-l-: ·\·							(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	.02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage		1			Ι		. , ,	(55) × (41)	ı				(=0)
(56)m= 32.01 If cylinder contains	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	Sv. LT	(56)
				· · ·					ını where (,HII) IS IIO		ΙΧΠ	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	`	,									0		(58)
Primary circuit				,	•		, ,		(1.	-1-1			
(modified by			ı —	ı —	ı —					- 	00.00		(EO)
(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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	n month	(62)n	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.18	172.29	181.54	163.58	160.9	144.64	139.74	152.	2 151.57	169.58	178.26	190.77		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (ente	r '0' if no sola	ar contribu	tion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	applies	see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	18.03	16.04	16.49	14.58	14.03	12.18	11.28	12.9	4 13.08	15.09	16.32	17.54		(63) (G2)
Output	t from wa	ater hea	ter										_	
(64)m=	174.47	153.83	162.37	146.4	144.19	129.86	125.78	136.	58 135.89	151.81	159.35	170.55		_
								(Output from w	ater heate	er (annual)	112	1791.08	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	90.74	80.63	86.21	79.4	79.34	73.1	72.31	76.4	5 75.41	82.23	84.28	89.27		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelli	ng or hot w	vater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.5	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	n <mark>g g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	^r L9a), a	lso se	e Table 5					
(67)m=	18.93	16.81	13.67	10.35	7.74	6.53	7.06	9.17	12.31	15.63	18.25	19.45		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.3	32 145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)), alsc	see Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.8	6 33.86	33.86	33.86	33.86		(69)
Pumps	s and far	ns gains	(Table 5	āa)									_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					_		_	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.8	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	121.96	119.98	115.87	110.27	106.64	101.53	97.18	102.7	75 104.73	110.52	117.06	119.99		(72)
Total i	internal	gains =	1			(66)	m + (67)m	ı + (68)	m + (69)m +	(70)m + (7	71)m + (72))m		
(73)m=	386.65	384.53	372.3	352.8	333.19	314.31	302.1	307.8	317.9	337.6	360.11	376.81		(73)
6. So	lar gains	S:												
	-		•	r flux from	Table 6a		-	tions to	convert to the	he applica		tion.		
Orient	ation: A	Access F Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	T	FF able 6c		Gains (W)	
East	0.9x	0.77	X	4.1	6	x 1	9.64	x	0.4	x	0.7	=	15.85	(76)
East	0.9x	0.77	x	4.	8	x 1	9.64	х	0.4	×	0.7	<u> </u>	18.29	(76)
East	0.9x	0.77	x	4.1	6	x 3	8.42	x	0.4	x [0.7	=	31.01	(76)
East	0.9x	0.77	х	4.	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(76)
	<u>L</u>		•											_

	East 0.9x 0.77 x 4.8 x 63.27 x 0.4 x 0.7 = 58.93 (76) East 0.9x 0.77 x 4.16 x 92.28 x 0.4 x 0.7 = 74.49 (76) East 0.9x 0.77 x 4.8 x 92.28 x 0.4 x 0.7 = 85.95 (76)														
East	0.9x	0.77	X	4.16		x	63.27	X	0.4	X	0.7	=	51.07	(76)	
East	0.9x	0.77	X	4.8		x [63.27	x	0.4	x	0.7	=	58.93	(76)	
East	0.9x	0.77	X	4.16		x [92.28	X	0.4	X	0.7	=	74.49	(76)	
East	0.9x	0.77	X	4.8		x [92.28	x	0.4	x	0.7	-	85.95	(76)	
East	0.9x	0.77	X	4.16		x [113.09	x	0.4	x	0.7		91.29	(76)	
East	0.9x	0.77	X	4.8		x [113.09	X	0.4	x	0.7		105.33	(76)	
East	0.9x	0.77	X	4.16		x [115.77	x	0.4	x	0.7		93.45	(76)	
East	0.9x	0.77	X	4.8		x	115.77	X	0.4	x	0.7		107.83	(76)	
East	0.9x	0.77	X	4.16		x [110.22	X	0.4	x	0.7		88.97	(76)	
East	0.9x	0.77	X	4.8		x [110.22	x	0.4	x	0.7		102.66	(76)	
East	0.9x	0.77	X	4.16		x [94.68	x	0.4	x	0.7		76.42	(76)	
East	0.9x	0.77	X	4.8		x [94.68	X	0.4	x	0.7		88.18	(76)	
East	0.9x	0.77	X	4.16		x [73.59	x	0.4	×	0.7		59.4	(76)	
East	0.9x	0.77	X	4.8		x [73.59	x	0.4	x	0.7		68.54	(76)	
East	0.9x	0.77	X	4.16		x [45.59	x	0.4	x	0.7		36.8	(76)	
East	0.9x	0.77	x	4.8		x [45.59	x	0.4	x	0.7		42.46	(76)	
East	0.9x	0.77	x	4.16		x [24.49	x	0.4	x	0.7		19.77	(76)	
East	0.9x	0.77	X	4.8		x [24.49	Х	0.4	X	0.7	-	22.81	(76)	
East	0.9x	0.77	x	4.16	=	x	16.15	x	0.4	x	0.7	-	13.04	(76)	
East	0.9x	0.77	x	4.8		x	16.15	x	0.4	x	0.7	╗ -	15.04	(76)	
	_							7							
Solar g	ains in	watts, calcu	lated	for each m	nonth			(83)m	n = Sum(74)m.	(82)m					
Solar c	ains in		lated 0.01		nonth 96.62	20	1.28 191.63	(83)m	<u> </u>	<mark>(82)m</mark> 79.26	42.58	28.08	7	(83)	
(83)m=	34.15		0.01	160.44 19	96.62			`	<u> </u>		42.58	28.08		(83)	
(83)m=	34.15	66.8 110	0.01	160.44 19 (84)m = (7	96.62	+ (8		`	1.6 127.94			28.08	_	(83)	
(83)m= Total g (84)m=	3 <mark>4.15</mark> ains – ii 420.8	66.8 110	0.01 solar 2.31	160.44 19 (84)m = (7 513.24 52	96.62 73)m + 29.81	⊦ (8 51	3)m , watts	164	1.6 127.94	79.26		<u> </u>	_		
(83)m= Total g (84)m= 7. Me	3 <mark>4.15</mark> ains — ir 420.8 an inter	66.8 110 nternal and 3 451.33 483 nal tempera	0.01 solar 2.31 ture (160.44 19 (84) m = (7513.24) 52 (46) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) (84) $($	96.62 73)m + 29.81 eason)	+ (8 51	3)m , watts	472	.41 445.84	79.26		<u> </u>	_		
(83)m= Total g (84)m= 7. Me Temp	34.15 ains – ir 420.8 an inter erature	66.8 110 nternal and 451.33 483 nal temperal during heat	o.01 solar 2.31 ture (160.44 19 (84)m = (7 513.24 52 (heating seeriods in the	96.62 73)m + 29.81 eason) ne livin	+ (8 51 ng a	3)m , watts 5.59 493.72	472	.41 445.84	79.26		<u> </u>		(84)	
(83)m= Total g (84)m= 7. Me Temp	34.15 ains – ir 420.8 an inter erature	66.8 111 nternal and a 451.33 48. nal tempera during heat tor for gains	o.01 solar 2.31 ture (160.44 19 (84)m = (7 513.24 52 (heating seeriods in the twing area,	96.62 73)m + 29.81 eason) ne livin	51 ng a (se	3)m , watts 5.59 493.72 area from Tab	472	.41 445.84	79.26	6 402.69	<u> </u>	21	(84)	
(83)m= Total g (84)m= 7. Me Temp	34.15 ains – ir 420.8 an inter erature	66.8 110 nternal and 451.33 483 nal temperal during heat tor for gains Feb N	o.o1 solar 2.31 ture (ing pe	160.44 19 (84)m = (7 513.24 52 (heating seeriods in the ving area, Apr	96,62 73)m + 29.81 eason) ne livin	+ (8 51 ng a (se	3)m , watts 5.59 493.72 area from Table Table 9a)	472	.41 445.84 , Th1 (°C)	79.26	6 402.69	404.89	21	(84)	
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	34.15 ains – in 420.8 an inter erature ation fac Jan 1	66.8 110 nternal and 3 451.33 483 nal temperal during heat tor for gains Feb N 0.99 0.	o.01 solar 2.31 ture (ing per sifer limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limite	160.44 19 (84)m = (7 513.24 52 (heating seeriods in the ving area, Apr 0.96 0	96,62 73)m + 29.81 eason) ne livir h1,m May	19 a (se	3)m , watts 5.59 493.72 area from Table Table 9a) Jun Jul 67 0.49	472 ole 9	.41 445.84 , Th1 (°C) ug Sep	79.26 416.8	6 402.69 Nov	404.89	21	(84)	
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	34.15 ains – in 420.8 an inter erature ation fac Jan 1	66.8 111 Aternal and 451.33 48: nal temperal during heat tor for gains Feb M 0.99 0.	o.01 solar 2.31 ture (ing per sifer limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limite	160.44 19 (84)m = (7 513.24 52 (heating seeriods in the living area, Apr 0.96 00 iving area	96,62 73)m + 29.81 eason) ne livir h1,m May	51 51 (se	3)m , watts 5.59 493.72 area from Table Table 9a) Jun Jul	472 ole 9	.41 445.84 , Th1 (°C) ug Sep .54 0.8	79.26 416.8	Nov 0.99	404.89	21	(84)	
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m=	34.15 ains – in 420.8 an inter erature ation fac Jan 1 interna 20.19	66.8 110 Aternal and 451.33 483 Mal temperal during heat tor for gains Feb M 0.99 0.00 I temperatur 20.29 20	o.01 solar 2.31 ture (ing pos for lime 1.99 ce in l	160.44 19 (84)m = (7 513.24 52 (heating seeriods in the living area, 0.96 00 iving area 20.71 2	96,62 73)m + 29.81 eason) ne livin h1,m May 0.86 T1 (fo	1 (see	3)m , watts 5.59 493.72 area from Table (Pa) lun Jul 67 0.49 v steps 3 to 7 0.98 21	164 472 ole 9 A 0.5	.41 445.84 , Th1 (°C) ug Sep .64 0.8 Table 9c) 1 20.95	79.26 416.8 Oct 0.97	Nov 0.99	Dec 1	21	(84)	
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp	34.15 ains – in 420.8 an inter erature ation face Jan 1 interna 20.19 erature	hternal and a 451.33 483 483 483 483 483 483 483 483 483 4	o.01 solar 2.31 ture (ing possion limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits for limits fo	160.44 19 (84)m = (7 513.24 52 (heating see eriods in the ving area, Apr 0.96 00 iving area 20.71 2 eriods in re	96,62 73)m + 29.81 29.81 29.81 29.81 29.81 29.81 29.86 20.86 20.9 20.9	51 51 (see	3)m , watts 5.59 493.72 area from Table Table 9a) Jun Jul 67 0.49 v steps 3 to 7 0.98 21 elling from Table 9a	472 472 472 A 0.5	.41	79.26 416.8 Oct 0.97	Nov 0.99	Dec 1 20.17	21	(84) (85) (86) (87)	
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(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	ains – internation factors an internation factors internation factors 20.19 erature 20.2	hternal and a 451.33 48. hal temperal during heat tor for gains Feb M 0.99 0. I temperatur 20.29 20 during heat 20.2 20 tor for gains	o.01 solar 2.31 ture (ing pos for li 10.47 ling pos 10.2 s for r	160.44 19 (84)m = (7 513.24 52 (heating see eriods in the eriods in the eriods in the eriods in the eriods in the eriods in the eriods in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in reaction in	96,62 73)m + 29.81 eason) ne livin h1,m May 0.86 T1 (fo 20.9 est of c 0.22	10 mg a control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (see control (s	3)m , watts 5.59 493.72 area from Table (Pa) Jun	4722	.41 445.84 .41 (°C) ug Sep .54 0.8 Table 9c) 1 20.95 9, Th2 (°C) 23 20.22	79.26 416.8 Oct 0.97 20.72	Nov 0.99 20.42	Dec 1 20.17 20.21	21	(84) (85) (86) (87) (88)	
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	e heating the mea				ro obtair	and at et	on 11 of	Table Of	o so tha	t Ti m-(76)m an	d ro-calc	ulato	
	ation fac					ieu ai sii	5p 11 01	i abic 3i), 50 iiia		rojili ali	u ie-caic	uiaie	
Γ,	Jan F	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	n factor	for ga	ins, hm	:										
(94)m=	1 0.	.99	0.98	0.94	0.83	0.63	0.44	0.48	0.76	0.95	0.99	1		(94)
Useful g	ains, hm		W = (94)	1)m x (84	4)m	1								
` ′		7.64	473.1	483.44	442.06	323.33	218.68	228.6	337.53	396.95	398.63	403.37		(95)
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()		.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
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(00)=	11.0		220.00	111.20	00.11				•		r) = Sum(9	L	1698.58	(98)
Casas b	ooting ro	auira	mant in	Is\A/lb/m2	2hroor			7014	i poi youi	(RVVIII) y Cal) = Ca m(c	O)15,912 —		= ' '
·	eating re	•											25.35	(99)
9b. Energ					Ĭ									
This part Fraction of											unity sch	neme.	0	(301)
	'							Table I	1) 0 11 11	OHO				=
Fraction of						•							1	(302)
The commu includes bo	-					-				up to four	other heat	sources; th	he latter	
Fraction	· ·	/ -				Tom power	Stations.	осс Аррсі	Idix O.				1	(303a)
Fraction of			7			eat numr				(3	02) x (303	a) –	1	(304a)
											02) X (303	α) – 		╡`
Factor for					,	` ''		•	iting sys	tem		ļ	1	(305)
Distribution	on loss fa	actor (Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space he	•												kWh/yea	r
Annual sp	pace hea	ting r	equirem	nent									1698.58	
Space he	eat from C	Comm	nunity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	= [1783.51	(307a)
Efficiency	of seco	ndary	/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space he	eating rec	uiren	nent froi	m secon	darv/sui	oplemen	tarv svst	tem	(98) x (30	01) x 100 ·	÷ (308) =	ľ	0	(309)
·					,,,,,,,,		, ,	-	, , ,	•	, ,	l	-	 `
Water he	_	ina ra	auirom	ont								Ī	4704.00	_
Annual w		•	•									l	1791.08	
If DHW fr Water he)				(64) x (30	03a) x (30	5) x (306) :	<u> </u>	1880.63	(310a)
Electricity			•					0.01	× [(307a).	(307e) +	· (310a)((310e)] =	36.64	(313)
Cooling S					n				2()	,	` , ,	' ' '	0	(314)
Space co	•	-		•		n if not 4	enter (1)		= (107) ÷	(314) =		 	0	(315)
•	• •						,		- (101) -	(0.4) =			U	(313)
Electricity mechanic								outside				[119.54	(330a)
22.161.110				- / = / 11	P							l		`

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	119.54	(331)
Energy for lighting (calculated in Appendix L)			334.24	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	3599.75	(338)
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 256	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	742.85	(367)
Electrical energy for heat distribution	[(313) x	0.52	19.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(373	2) =	761.86	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		761.86	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	62.04	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	173.47	(379)
Energy saving/generation technologies (333) to (334) as application 1	able	0.52 × 0.01 =	-268.93	(380)
Total CO2, kg/year sum of (376)(382) =			728.45	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.87	(384)
El rating (section 14)			91.28	(385)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: Sample 5 (Top) Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x (2a) =(3a) 67 3 201 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)67 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201 (5) other total m³ per hour main secondary heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) 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) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.27 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32		
Calculate effec		•	rate for t	he appli	cable ca	se			ļ	<u> </u>			
If mechanica												0	(23
If exhaust air h		0		, ,	,	. `	,, .	`) = (23a)			0	(2:
If balanced with		•	•	•		,						0	(23
a) If balance		i			1	- 	- ^ `	í `		` 	- ` `	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	I	(2
b) If balance	1	i			1	, , ,	i ,	í `	, 	` 		l	-
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	I	(2
c) If whole h				•	•				E (221	٥)			
$\frac{11 (220)11}{24c)m=0}$	0.5 x	0	nen (240	b) = (230)		0 0 Wise	c) = (22k)	0	.5 × (231) 0	0		(2
·	<u> </u>				<u> </u>			<u> </u>					(2
d) If natural if (22b)n							on from 1 0.5 + [(2		0.5]				
24d)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(2
Effective air	change	rate - er	nter (24a	or (24k	o) or (24	c) or (24	d) in box	· (25)	!				
25)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(2
3. Heat losse					Not Ar		U-valı		A V I I		le volue		A V k
LEMENT	Gros area		Openin m		Net Ar A ,r		W/m2		A X U (W/		k-value kJ/m²-k		A X k kJ/K
oors					2.4	х	1	=	2.4	$\dot{\Box}$			(2
Vin <mark>dows</mark> Type	e 1				4.16	x1	/[1/(1.4)+	0.04] =	5.52	Ħ			(2
Vindows Type	2				4.8	x1.	/[1/(1.4)+	0.04] =	6.36	Ħ			(2
Valls Type1	29.	4	8.96		20.44	1 X	0.18		3.68	5 1		7 -	(2
Valls Type2	12		2.4		9.6	<u> </u>	0.18	-	1.73	-		╡╞	(2
Valls Type3	2.4		0	=	2.44	=	0.18	-	0.44	륵 ¦		╡	(2
Roof	67	_	0	_	67	^	0.13	=	8.71	-		╡	(3
otal area of e						=	0.13		0.71				
for windows and			offective wi	ndow I I-va	110.8		n formula 1	/[(1/ ₋ valı	: 0.41 مراها	as aivan ir	n naraaranh	132	(3
tor windows and tinclude the area						atou using	, ioimala i	/[(<i>10)</i> +0.0 +j	us giveirii	i paragrapir	J.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				28.84	(3
leat capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	1057.72	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Medium	Ī	250	(3
or design assess				construct	ion are no	t known pr	ecisely the	e indicative	e values o	f TMP in T	able 1f		
an be used inste				.a.:.a. A.:	ايناممم	/					Г		—,,
hermal bridge	•	,		• .	•	٨						5.54	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 X (3	51)			(33) +	(36) =		[34.38	(3
entilation hea		alculated	monthly	/						(25)m x (5))	04.00	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 37.12	36.97	36.82	36.11	35.98	35.36	35.36	35.25	35.6	35.98	36.24	36.52		(3
, <u> </u>	<u> </u>	1 \\//k	I					(30)m	= (37) + ((38)m			
last transfor a									- 13/1+(SECTION			
leat transfer (39)m= 71.5	71.34	71.19	70.49	70.35	69.74	69.74	69.62	69.98	70.35	70.62	70.9	ı	

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.06		
	Į.	!				ļ	ļ	'	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		17		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								<u> - 15 </u>					
(44)m= 94.34	90.91	87.48	84.05	80.62	77.19	77.19	80.62	84.05	87.48	90.91	94.34		
						ļ.			Total = Su	m(44) ₁₁₂ =		1029.18	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 139.91	122.36	126.27	110.08	105.63	91.15	84.46	96.92	98.08	114.3	124.77	135.49		
If in atom to no aug.	water bacti	ng of noint	of use /pe	hat water	, otorogol	antar O in	havea (46		Total = Su	m(45) ₁₁₂ =		1349.41	(45)
If inst <mark>antane</mark> ous v				-		_							(40)
(46)m= 20.99 Water storage	18.35	18.94	16.51	15.84	13.67	12.67	14.54	14.71	17.15	18.72	20.32		(46)
Storage volum		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	_	150		(47)
If community h	,												()
Otherwise if n	_			_			, ,	ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	factor fro	m Table	2b							0.	54		(49)
Energy lost fro		•					(48) x (49)) =		0.	75		(50)
b) If manufact Hot water stor			-										(E1)
If community h	•			e z (KVV	ii/iiti e/ua	iy)					0		(51)
Volume factor	_		011 110								0		(52)
Temperature f	factor fro	m Table	2b								0		(53)
Energy lost fro	om watei	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5		7)m = (56)	m where (m Appendi	x H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	t loss (ar	nual) fro	m Table								0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by				,		` '	, ,		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	i loss ca	lculated	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 h	neat req	uired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		(62)
Solar DI	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	r heating)	I	
(add a	dditiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	•	(63) (G2)
Output	t from w	ater hea	ter											
(64)m=	186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09		_
		-		-		-	-	Outp	out from wa	ater heate	r (annual) ₁	12	1898.03	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	83.79	74.35	79.26	72.68	72.4	66.38	65.36	69.5	68.68	75.28	77.56	82.33		(65)
inclu	ude (57)	m in cald	culation o	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. In	ternal ga	ains (see	e Table 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=	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56	108.56		(66)
Ligh <mark>tin</mark>	<mark>ig g</mark> ains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	18.37	16.32	13.27	10.05	7.51	6.34	6.85	8.91	11.95	15.18	17.72	18.89		(67)
App <mark>lia</mark>	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	190.2	192.17	187.2	176.61	163.24	150.68	142.29	140.32	145.29	155.88	169.24	181.8		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m=	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86	33.86		(69)
Pumps	s and fa	ns gains	(Table 5	 5a)		-	-	-		-	-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	/aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85	-86.85		(71)
Water	heating	gains (T	able 5)				=	=		=	-			
(72)m=	112.63	110.65	106.53	100.94	97.31	92.19	87.85	93.42	95.4	101.18	107.72	110.65		(72)
Total i	internal	gains =	:			(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	379.77	377.7	365.57	346.16	326.63	307.78	295.56	301.21	311.21	330.81	353.25	369.91		(73)
6. So	lar gains	s:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat		ion.		
Orient		Access F		Area		Flu		-	g_ 	_	FF		Gains	
	ļ	Table 6d		m²			ole 6a	, <u> </u>	able 6b		able 6c	<u></u>	(W)	_
East	0.9x	0.77	X	4.1	6	x 1	9.64	X	0.63	x	0.7	=	24.97	(76)
East	0.9x	0.77	х	4.8	3	x 1	9.64	x	0.63	x	0.7	=	28.81	(76)
East	0.9x	0.77	Х	4.1	6	x 3	88.42	X	0.63	x	0.7	=	48.85	(76)
East	0.9x	0.77	X	4.8	3	x 3	88.42	X	0.63	X	0.7	=	56.36	(76)

East	0.9x	0.77	X	4.16	X	63.2	27	x	0.63	x	0.7		=	80.44	(76)
East	0.9x	0.77	X	4.8	X	63.2	27	X	0.63	x	0.7		=	92.82	(76)
East	0.9x	0.77	X	4.16	X	92.2	28	x	0.63	X	0.7		=	117.32	(76)
East	0.9x	0.77	X	4.8	X	92.2	28	x	0.63	x	0.7		=	135.37	(76)
East	0.9x	0.77	X	4.16	X	113	.09	x	0.63	X	0.7		=	143.78	(76)
East	0.9x	0.77	X	4.8	X	113	.09	x	0.63	X	0.7		=	165.9	(76)
East	0.9x	0.77	X	4.16	X	115	.77	x	0.63	x	0.7		=	147.18	(76)
East	0.9x	0.77	X	4.8	X	115	.77	x	0.63	x	0.7		=	169.83	(76)
East	0.9x	0.77	X	4.16	X	110	.22	x	0.63	x	0.7		=	140.13	(76)
East	0.9x	0.77	X	4.8	X	110	.22	x	0.63	x	0.7		=	161.68	(76)
East	0.9x	0.77	X	4.16	X	94.0	68	x	0.63	X	0.7		=	120.37	(76)
East	0.9x	0.77	X	4.8	X	94.0	68	x	0.63	x	0.7		=	138.88	(76)
East	0.9x	0.77	X	4.16	X	73.	59	x	0.63	x	0.7		=	93.56	(76)
East	0.9x	0.77	X	4.8	X	73.	59	x	0.63	x	0.7		=	107.95	(76)
East	0.9x	0.77	X	4.16	X	45.	59	x	0.63	X	0.7		=	57.96	(76)
East	0.9x	0.77	X	4.8	X	45.	59	x	0.63	x	0.7		=	66.88	(76)
East	0.9x	0.77	X	4.16	X	24.4	49	x	0.63	x	0.7		=	31.13	(76)
East	0.9x	0.77	X	4.8	X	24.4	49	Х	0.63	X	0.7		=	35.92	(76)
East	0.9x	0.77	x	4.16	x	16.	15	x	0.63	х	0.7		=	20.53	(76)
East	0.9x	0.77	x	4.8	х	16.	15	×	0.63	Х	0.7		=	23.69	(76)
Solar g	ains in	watts, calcul	ated	for each m	nonth		(8	83)m	= Sum(74)m	. <mark>(8</mark> 2)m					
(83)m=	53.78	105.21 173	3.26	252.69 30	9.68			83)m 259.:		.(82)m 124.84	4 67.06	44.23	3		(83)
(83)m=	53.78		3.26	252.69 30	9.68						4 67.06	44.23	3		, ,
(83)m=	53.78	105.21 173	s.26 solar	252.69 30 (84)m = (7	9.68 3 (3)m + (83)m , v	301.81 watts		25 201.51			44.23			(83) (84)
(83)m= Total g (84)m=	53.78 ains — ii 433.55	105.21 173	3.26 solar 3.83	252.69 30 (84)m = (7 598.85 63	99.68 3 (3)m + (36.31	83)m , v	301.81 watts	259.	25 201.51	124.84					, ,
(83)m= Total g (84)m= 7. Me	53.78 ains — ii 433.55 an inter	105.21 173 nternal and s 482.91 538	3.26 solar 3.83 ure (252.69 30 (84)m = (7 598.85 63 heating se	9,68 3 (3)m + (36.31 (83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	, ,
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71	124.84				21	(84)
(83)m= Total g (84)m= 7. Me Temp	53.78 ains – il 433.55 an inter erature	105.21 173 nternal and s 482.91 538 nal temperat during heati tor for gains	3.26 solar 3.83 ture (252.69 30 (84)m = (7 598.85 63 heating se eriods in the ving area,	9.68 3)m + (36.31 0 ason)	83)m , v 624.8 5	301.81 watts 597.37	259 560.	25 201.51 46 512.71 Th1 (°C)	124.84	4 420.3		14	21	(84)
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(93)m= 19.13	19.3	19.6	19.99	20.28	20.41	20.44	20.43	20.36	19.98	19.49	19.1		(93)
8. Space hea	ting requ	uirement											
Set Ti to the					ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	ī									١		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	0.98	0.93	0.82	0.63	0.44	0.5	0.77	0.95	0.99	1	1	(94)
Useful gains,	<u> </u>	<u> </u>			0.03	0.44	0.5	0.77	0.93	0.99	'	İ	(01)
(95)m= 431.37	478.35	526.41	558.24	522.37	391.03	265.65	277.6	395.38	434.69	416.08	412.49		(95)
Monthly average								000.00		1.0.00	1.12.10	l	,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	an intern	al tempe	erature,	L Lm , W =	L =[(39)m :	x [(93)m	 – (96)m	1	ļ		l	
(97)m= 1060.36		932.66	781.63	603.7	405.41	267.51	280.88	437.95	660.12	875.06	1056.59		(97)
Space heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		l	
(98)m= 467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
							Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	2337.86	(98)
Space heatin	a require	ement in	kWh/m²	/vear								34.89	(99)
·	• .			•			:	NID)				04.00	
9a. Energy red	•	nts – Indi	viduai n	eating s	ystems i	nciuaing	micro-C	JHP)					
Space heating Fraction of sp		t from se	econdar	//supple	mentary	system						0	(201)
Fraction of sp					y		(202) = 1 -	(201) =				1	(202)
							(204) = (204)		(202)] _				╡` ′
Fraction of to							(204) = (2)	02) 🗓 [1 –	(203)] =			1	(204)
Efficiency of r												93.5	(206)
Efficiency of s	seconda	ry/supple	ementar	y heating	system	1, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin)							1	
467.97	368.9	302.25	160.84	60.51	0	0	0	0	167.71	330.47	479.21		
(211)m = {[(98)m x (20	4)] } x 1	00 ÷ (20	6)								-	(211)
500.5	394.55	323.26	172.02	64.72	0	0	0	0	179.37	353.44	512.52		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,101}	Ē	2500.39	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									
$= \{[(98)m \times (20)]\}$		00 ÷ (20	_			i						1	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating													
Output from w					400.04	404.00	442.50	440.47	400.0	400.00	400.00	1	
186.5	164.45	172.86	155.17	152.22	136.24	131.06	143.52	143.17	160.9	169.86	182.09	70.0	7(246)
Efficiency of w			24.04	00.50	70.0	70.0		T = 0	0.4.00	00.50	07.00	79.8	(216)
(217)m= 87.17	86.91	86.29	84.91	82.58	79.8	79.8	79.8	79.8	84.92	86.56	87.28	İ	(217)
Fuel for water $(219)m = (64)$	_												
(219)m = 213.95	189.22	200.33	182.75	184.34	170.73	164.23	179.84	179.41	189.46	196.24	208.63		
							Tota	I = Sum(2	19a) ₁₁₂ =	ı	ı	2259.13	(219)
Annual totals									k'	Wh/yeaı	•	kWh/year	
Space heating		ed, main	system	1						•		2500.39	
													_

Water heating fuel used				2259.13	1
Electricity for pumps, fans and electric keep-hot					J
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =			75	(231)	
Electricity for lighting				324.5	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =				5159.01	(338)
12a. CO2 emissions – Individual heating systems including micro-CHP					
	Energy kWh/year	0 ,		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	540.08	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	487.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1028.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	168.41	(268)
Total CO2, kg/year TER =	sum	of (265)(271) =		1235.39	(272)

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: Flat

Detachment:

2022 Year Completed:

Floor Location: Floor area:

Storey height: 55.1 m²

Floor 0 3 m

26 m² (fraction 0.472) Living area: Unspecified

Front of dwelling faces:

Opening types:

Name:	Source:	Type:	Glazing:	Arg <mark>on:</mark>	Frame:
DOOR	Manufactur	er Solid			Wood
W	Manufactur	er Windows	low-E, $En = 0.05$, <mark>soft</mark> coat No	
Balcony	Manufactur	er Windows	low-E, En = 0.05	, <mark>soft</mark> coat No	

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. o
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
Balcony		W	West	0	0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
W	24	8.96	15.04	0.15	0	False	N/A
INT	24	2.4	21.6	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Roof	55.1	0	55.1	0.11	0		N/A
Internal Element	<u>S</u>						

Party Elements

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges:

of Openings:

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 3
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

			User E	Details:						
Assessor Name: Software Name:	Stroma FSAP 2	2012		Strom Softwa				Versio	on: 1.0.5.51	
		Р	roperty	Address	: Sampl	е 6 (Тор)			
Address :										
1. Overall dwelling dime	nsions:			(0)						•>
Ground floor				a(m²) 55.1	(1a) x	Av. He	gight(m)	(2a) =	Volume(m)	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	·(1e)+(1r	۱)	55.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	165.3	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	'y □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	ır ── _{(6a}
Number of open flues	0 +		- - - - - - -	0	」	0	x	20 =	0	(6b
Number of intermittent far			J L		J			10 =		╡`
	15				Ļ	0			0	(7a
Number of passive vents					Ĺ	0		10 =	0	(7b
Number of flueless gas fir	es					0	X	40 =	0	(7c
								Air ch	nanges per he	our
Infiltration due to chimney	ge flues and fans -	- (6a)+(6b)+(7	7a)+(7b)+((7c) =	Г		_	÷ (5) =		(8)
If a pressurisation test has be					continue f	0 from (9) to		÷ (5) =	0	(0)
Number of storeys in th									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.					•	ruction			0	(11
if both types of wall are pro deducting areas of openin		rresponding to	the grea	ter wall are	a (after					
If suspended wooden fl		sealed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	er 0.05, else enter	0							0	(13
Percentage of windows	and doors draugh	nt stripped							0	(14
Window infiltration				0.25 - [0.2	. ,		>		0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the	•		•	•	•	netre of e	envelope	area	3	(17
Air permeability value applies	-					is beina u	ısed		0.15	(18
Number of sides sheltered			.0 0. 4 40,	g. 00 a po					3	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.78	(20
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.12	(21
Infiltration rate modified for	or monthly wind sp	eed				_			-	
Jan Feb	Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a) ~ (22	r)m : 4									
Wind Factor $(22a)m = (22a)m = 1.27$	1)m ÷ 4 1.23 1.1 1.0	8 0.95	0.95	0.92	1	1.08	1.12	1.18]	
1.20		- 1 0.00	L 3.55	1 3.02	<u> </u>	1	12	10	I	

0.15	0.15	0.14	ng for sh 0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe		-	rate for t	he appli	cable ca	se	<u> </u>				ļ		
If mechanica												0.5	(23
If exhaust air h		0 11		, ,	,	. ,	,, .	•) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2:
a) If balance						- ` ` 	HR) (24a	``	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance							<u> </u>	<u>`</u>	 		<u> </u>	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00l-				
<u> </u>	1 < 0.5 ×	(23b), t	nen (240	(230) = (230)	o); other	wise (24)	C) = (220)	0) M + 0.	5 × (230	0	0		(2
						<u> </u>			U	U	U		(2
d) If natural if (22b)n					ve input erwise (2				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		<u> </u>	ļ		
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse									• >/ 11				\
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valu W/m2		A X U (W/I	<)	k-value kJ/m²-k		X k J/K
oors					2.4	×	1.4	= [3.36				(2
Vin <mark>dows</mark> Type	1				4.16	x	1/[1/(1)+	0.04] =	4	Ħ			(2
Vindows Type					4.8		1/[1/(1)+	L L	4.62	Ħ			(2
Valls Type1	24		8.96		15.04		0.15	=	2.26	片 ,) (2
Valls Type2	24		2.4		21.6	x	0.15		3.23	러 片		╡	一 (2
Valls Type3	2.4		0	=	2.4	x	0.35		0.84	륵 ;			= \`(2
Roof	55.		0	_	55.1	x	0.11		6.06	북 ¦			(3
otal area of e						=	0.11	[0.00				
for windows and			effective wi	ndow I I-vs	105.5		ı formula 1	/[/1/ L.v.alı	ω) τΟ Ο Λ Ι ε	e aiven in	naragranh	. 2 2	(3
include the area						atou using	TOTTIGIA 1	/[(i/ O · Vaid	C)+0.0+j c	is giveri iii	paragrapii	0.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				24.37	(3
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1042.46	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium	İ	250	
or design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste					ا دناه مدم ما	,					İ		— ,
hermal bridge	,	,			•	`						15.83	(3
details of therma otal fabric he		are not kn	OWII (30) =	= 0.05 X (3	1)			(33) +	(36) =			40.19	(3
entilation hea		alculated	l monthly	/					= 0.33 × (25)m x (5)))	40.13	(`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 13.8	13.64	13.48	12.69	12.53	11.74	11.74	11.58	12.06	12.53	12.85	13.17		(3
,					I	I	L			l		l	•
ant transfer	nofficia-	at 1/1/1/											
leat transfer of 53.99	53.83	nt, W/K 53.67	52.88	52.72	51.93	51.93	51.77	52.25	= (37) + (3 52.72	53.04	53.36		

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.98	0.97	0.96	0.96	0.94	0.94	0.94	0.95	0.96	0.96	0.97		
	!	!				!			Average =	Sum(40) ₁	12 /12=	0.96	(40)
Number of day		`							<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		84		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		7.91		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		
_						_				ım(44) ₁₁₂ =		934.88	(44)
Energy content of		used - cal					OTm / 3600						
(45)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		–
If inst <mark>antane</mark> ous w	vater heati	ng at point	of use (no	n hot water	storage).	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	_	1225.78	(45)
(46)m= 19.06	16.67	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Water storage		17.2	10	14.55	12.72	11.01	10.21	13.50	10.07	17	10.40		(10)
Storage volum	ne (litres)) includir	ng any so	olar or <mark>V</mark>	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		oolorod l	ooo foot	or io kno		2/d0x/):							(40)
a) If manufact				oi is kiio	WII (KVVI	i/uay).					0		(48)
Temperature f							(40) (40)	\			0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			•							0.	02		(51)
If community h	•		on 4.3										
Volume factor			01							-	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	03		(54)
Enter (50) or	` , ` `	,	for ooob	manth			//EC\m /	'EE\ (44)		1.	.03		(55)
Water storage					Ι			(55) × (41)	ı				(=0)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	iv Ll	(56)
If cylinder contains										1		IA I I	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	• •	, ,		(1.	-1-1			
(modified by			ı —		ı —			<u> </u>		- 	00.00		(EO)
(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)

Comb	i loss ca	lculated	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 I	neat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.36	161.08	169.97	153.49	151.23	136.29	132	143.32		159.11	166.83	178.35		(62)
Solar D	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	vwhrs	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	16.59	14.71	15.14	13.33	12.81	11.05	10.22	11.77	11.91	13.81	14.97	16.12	•	(63) (G2)
Outpu	t from w	ater hea	ter											
(64)m=	163.1	143.95	152.16	137.57	135.73	122.64	119.09	128.87	7 128.08	142.61	149.26	159.55		
		•				•		Ot	utput from wa	ater heate	r (annual)₁	12	1682.61	(64)
Heat o	gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	86.48	76.9	82.36	76.04	76.12	70.32	69.73	73.5	72.42	78.74	80.48	85.14		(65)
inclu	ude (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gair	ıs (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>tir</mark>	ng gains	(calcu <mark>la</mark>	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.29	13.58	11.05	8.36	6.25	5.28	5.7	7.41	9.95	12.63	14.74	15.72		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			•	
(68)m=	160.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooki	ng gains	(calcula	ited in A	pendix	L, equat	tion L15	or L15a	, also	see Table	5			'	
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pump:	s and fa	ns gains	(Table 5	Ба)					•	!			ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (negat	ive valu	es) (Tab	le 5)			•	•	•		1	
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	[(71)
Water	heating	gains (T	able 5)						•				ı	
(72)m=	116.23	114.43	110.7	105.62	102.32	97.67	93.73	98.78	100.58	105.84	111.78	114.44		(72)
Total	internal	gains =				(66)	m + (67)m	+ (68)n	n + (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m=	342.57	340.73	330.26	313.56	296.88	280.66	270.06	275.17	7 283.69	300.57	319.89	334.13		(73)
6. So	lar gains	S:												
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and assoc	ated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu			g _	_	FF		Gains	
		Table 6d		m²		Tal	ole 6a		Table 6b	T	able 6c		(W)	
West	0.9x	0.77	X	4.1	6	x 1	9.64	х	0.4	x	0.7	=	15.85	(80)
West	0.9x	0.77	X	4.8	8	x 1	9.64	х	0.4	x	0.7	=	18.29	(80)
West	0.9x	0.77	X	4.1	6	x 3	8.42	x	0.4	x	0.7	=	31.01	(80)
West	0.9x	0.77	X	4.8	8	x 3	8.42	x	0.4	x	0.7	=	35.78	(80)

			_					_						
West	0.9x	0.77	X	4.16	x	6	3.27	X	0.4	x	0.7	=	51.07	(80)
West	0.9x	0.77	X	4.8	X	6	3.27	X	0.4	x	0.7	=	58.93	(80)
West	0.9x	0.77	X	4.16	Х	g	92.28	X	0.4	X	0.7	=	74.49	(80)
West	0.9x	0.77	X	4.8	X	9	92.28	X	0.4	X	0.7	=	85.95	(80)
West	0.9x	0.77	x	4.16	х	1	13.09	X	0.4	x	0.7	=	91.29	(80)
West	0.9x	0.77	x	4.8	х	1	13.09	X	0.4	X	0.7	=	105.33	(80)
West	0.9x	0.77	x	4.16	x	1	15.77	x	0.4	X	0.7	=	93.45	(80)
West	0.9x	0.77	X	4.8	х	1	15.77	X	0.4	X	0.7	=	107.83	(80)
West	0.9x	0.77	x	4.16	х	1	10.22	X	0.4	X	0.7	=	88.97	(80)
West	0.9x	0.77	x	4.8	х	1	10.22	x	0.4	x	0.7	=	102.66	(80)
West	0.9x	0.77	X	4.16	х	9	94.68	X	0.4	X	0.7	=	76.42	(80)
West	0.9x	0.77	x	4.8	х	9	94.68	X	0.4	X	0.7	=	88.18	(80)
West	0.9x	0.77	x	4.16	x	7	73.59	x	0.4	x	0.7	=	59.4	(80)
West	0.9x	0.77	x	4.8	x	7	73.59	x	0.4	x	0.7		68.54	(80)
West	0.9x	0.77	x	4.16	x	4	15.59	x	0.4	X	0.7		36.8	(80)
West	0.9x	0.77	x	4.8	×	4	15.59	x	0.4	X	0.7		42.46	(80)
West	0.9x	0.77	х	4.16	x	2	24.49	x	0.4	x	0.7		19.77	(80)
West	0.9x	0.77	x	4.8	X	2	24.49	Х	0.4	X	0.7	=	22.81	(80)
West	0.9x	0.77	x	4.16	×	1	6.15	x	0.4	х	0.7	_	13.04	(80)
West	0.9x	0.77	x	4.8	x	1	6.15	×	0.4	x	0.7	_ =	15.04	(80)
								7						
				Company of the	a makla			(00)	0 (74)	(00)				
Solar g	ains in	watts, calcul	ated	for each m	ionth			(83)m	$n = Sum(74)m \dots$.(8Z)m			_	
Solar g (83)m=	ains in 34.15		ated 0.01			201.28	191.63	(83)m 164		79.26		28.08		(83)
(83)m=	34.15		0.01	160.44	6.62		191.63	`			_	28.08		(83)
(83)m=	34.15	66.8 110 nternal and s	0.01	160.44 19 (84)m = (7	96.62 (3)m +		191.63	`	1.6 127.94		42.58	28.08 362.21		(83) (84)
(83)m= Total g	3 <mark>4.15</mark> ains — ii 376.72	66.8 110 nternal and s	0.01 solar 0.27	160.44 19 (84)m = (7 474 4	96.62 (3)m + 93.5	(83)m	191.63 , watts	164	1.6 127.94	79.26	42.58			, ,
(83)m= Total g (84)m= 7. Mea	3 <mark>4.15</mark> ains — ii 376.72 an inter	66.8 110 nternal and s 407.53 440	0.01 solar 0.27 ture (160.44 19 (84) m = $(7$ 474 49 (84) m seconds	96,62 (3)m + 93.5 (ason)	(83)m 481.94	191.63 , watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58		21	, ,
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter erature	66.8 110 nternal and s 407.53 440 nal tempera	o.01 solar o.27 ture (160.44 19 (84)m = (7 474 49 (heating seeriods in the	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94	191.63 , watts 461.69	439	1.6 127.94 .77 411.64	79.26	42.58			(84)
Total g (84)m= 7. Mea	34.15 ains — ir 376.72 an inter erature	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains	o.01 solar o.27 ture (160.44 19 (84)m = (7 474 49 heating seeriods in the ving area,	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94	191.63 , watts 461.69	439 ble 9	1.6 127.94 .77 411.64	79.26	3 362.47		21	(84)
Total g (84)m= 7. Mea	34.15 ains – in 376.72 an inter erature tion fac	66.8 110 nternal and s 407.53 440 nal tempera during heati tor for gains Feb N	o.01 solar o.27 ture (ng po	160.44 19 (84)m = (7 474 4: (heating seeriods in the ving area, Apr	96.62 (3)m + 93.5 (ason) e living	(83)m 481.94 g area t	191.63 , watts 461.69 from Tab	439 ble 9	.77 411.64 , Th1 (°C)	79.26	3 362.47 Nov	362.21	21	(84)
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0.72 1.70 0.72 1.70 0.72 1.70 0.72	79.26 379.8 Oct 0.96 20.68 20.12 0.94 e 9c) 19.75 A = Li	3 362.47 Nov 0.99 2 20.11 0.99 19.26 ving area ÷ (Dec 1 20.06 20.11 1	21	(84) (85) (86) (87) (88) (89)

(93)m= 19.44	19.58	19.83	20.17	20.41	20.52	20.54	20.54	20.49	20.19	19.76	19.42		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	L	l	<u> </u>										
(94)m= 0.99	0.99	0.98	0.93	0.82	0.62	0.44	0.48	0.75	0.95	0.99	0.99		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 374.3	403.06	429.5	441.63	405.39	299.4	203.63	212.72	309.59	359.08	357.76	360.31		(95)
Monthly aver		T T	·		r	•				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 (97)m= 817.25	e for me	an intern	595.82	erature, 459.34		=[(39)m : 204.56	<u> </u>	<u> </u>	505.4	674.70	042.02		(97)
(97)m= 817.25 Space heatin	<u> </u>				307.59	<u> </u>	214.28	333.61		671.72	812.02		(97)
(98)m= 329.56	260.12	212.84	111.02	40.14	0	0.02	0	0	108.86	226.05	336.07		
(60)111= 626.66	200.12	212.01	111.02	10.11				l per year		l .	<u> </u>	1624.65	(98)
Space heatin	a roquir	omont in	k\\/b/m2	2/voor			. 0.10	. poi you	(,) ca.	<i>)</i> ••••••(•	() 1		(99)
·	• .			•							l	29.49	(99)
9b. Energy red			The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	Ĭ									
This part is us Fraction of spa							.	•		unity scr	neme.	0	(301)
Fraction of spa								,				1	(302)
							-1/	CUID and	to form	- 11 11 1			(302)
The c <mark>ommu</mark> nity so inclu <mark>des boi</mark> lers, h									ip to four	otner neat	sources; tr	ne latter	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump				(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem		[1	(305)
Distribution los	ss factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m				ĺ	1.05	(306)
Space heating	g										L	kWh/yea	 r
Annual space	_	requiren	nent									1624.65	
Space heat fro	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	<u> </u>	1705.88	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/suլ	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	נ												
Annual water		equirem	ent									1682.61	
If DHW from c											,		_
Water heat fro		-)				(64) x (30	03a) x (30	5) x (306) :	= [1766.74	(310a)
Electricity use	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	34.73	(313)
Cooling Syste	m Energ	y Efficie	ncy Ration	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p							الالمقريم				ı		7(000.)
mechanical ve	entilation	- palanc	ea, extra	act or po	sitive in	put from	outside					98.31	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	9b) + (330g) =	98.31	(331)
Energy for lighting (calculated in Appendix L)			270.05	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =	3322.82	(338)
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	256	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	704.02	(367)
Electrical energy for heat distribution	[(313) x	0.52	18.02	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2) =	722.04	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		722.04	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	51.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	140.16	(379)
Energy saving/generation technologies (333) to (334) as application 1	able	0.52 x 0.01 =	-268.93	(380)
Total CO2, kg/year sum of (376)(382) =			644.29	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.69	(384)
El rating (section 14)			91.38	(385)

				User D	etails:						
Assessor Name:	Ctromo I	-CAD 201	0		Strom				Versia	on: 1 0 F F1	
Software Name:	Stroma	FSAP 201		roporty	Softwa		rsion: e 6 (Top	\	versic	n: 1.0.5.51	
Address :			Г	Toperty	Address	. Заттріє	e 6 (10p)			
1. Overall dwelling dime	ensions:										
				Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor				,	55.1	(1a) x		3	(2a) =	165.3	(3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	n) =	55.1	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	165.3	(5)
2. Ventilation rate:											
	main heatin		econdar neating	ry	other		total			m³ per hoι	ır
Number of chimneys	0	+ [0	7 + [0	=	0	X e	40 =	0	(6a
Number of open flues	0	-	0	T + F	0	ī = Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans						2	x	10 =	20	(7a
Number of passive vents	5					F	0	×	10 =	0	一 (7b
Number of flueless gas f						F	0	X ·	40 =	0	(7c)
garage garage						L					(, 0,
									Air ch	nanges <mark>per</mark> he	our
Infilt <mark>ration</mark> due to chi <mark>mne</mark>	ys, flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b			ed, procee	ed to (17),	otherwise (continue fr	rom (9) to	(16)			_
Number of storeys in t Additional infiltration	he dwelling	(ns)						[(0)	410.4	0	(9)
Structural infiltration: 0) 25 for steel	or timber	frame o	. 0.35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10
if both types of wall are p						•	dollon			0	('''
deducting areas of openi				4 / 1							_
If suspended wooden		•	led) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en Percentage of window	,		trinned							0	(13
Window infiltration	3 and doors	draugitt 3	пррси		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16
Air permeability value,	q50, expres	sed in cut	oic metre	es per ho	our per s	quare m	etre of e	envelope	area	5) (17
lf based on air permeabi	lity value, th	en (18) = [(1	7) ÷ 20]+(8), otherw	ise (18) =	(16)				0.37	(18
Air permeability value applie		ation test ha	s been doi	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed				(20) = 1 -	[0 075 x (1	19\1 –			3	(19
Infiltration rate incorpora	tina shaltar t	actor			(20) = 1 (21) = (18)		10)] =			0.78	= (20
Infiltration rate modified t	•		4		(-1) - (10	, ^ (20) =				0.29	(21
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1 5411	1 541	1 , 149	<u> </u>	1 000	1 1101	1 200	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		
	<u> </u>		1	1	1	l .	1	1	I	I	
Wind Factor (22a)m = (2		1				-				1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.37	ation rat	0.35	0.32	0.31	0.27	0.27	0.27	0.29	0.31	0.32	0.34		
Calculate effec							0.27	0.23	0.01	0.52	0.54		
If mechanica											[0	(23
If exhaust air h		0 11		, ,	, ,	. `	,, .	•) = (23a)			0	(23
If balanced with		-		_								0	(23
a) If balance						<u> </u>	- ` ` - 	<u> </u>	 	- 	- ` 	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance							<u> </u>	<u>`</u>	- ` `	<u> </u>			10.
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				-	-				F (00h	. \			
if (22b)n 24c)m= 0	1 < 0.5 ×	(23b), t	nen (240	(23D) 0	o); otnerv	wise (24	C) = (220)	0) m + 0.	5 × (230	0	0		(24
,				_					0				(2-
d) If natural if (22b)n									0.5]				
24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25
3. Heat losse					N . A				A >< 1.1				\/ I
ELEMENT	Gros area		Openin		Net Ar A ,r		U-valu W/m2		A X U (W/I	K)	k-value kJ/m²-k		X k J/K
Doors					2.4	x	1	= [2.4				(26
Nindows Type	1				4.16	x1.	/[1/(1.4)+	0.04] =	5.52	Ħ			(27
Nindows Type					4.8		/[1/(1.4)+	L L	6.36	Ħ			(27
Nalls Type1	24		8.96	_	15.04		0.18	=	2.71	≒		7	(29
Walls Type2	24		2.4	=	21.6	X	0.18		3.89			╣	(29
Walls Type3	2.4		0	=						믁 ¦		┪┝═	(29
Roof				=	2.4	=	0.18	=	0.43	륵 ¦		╣	=
	55.		0		55.1	x	0.13	=	7.16				(30
Γotal area of e for windows and			ffoctivo wi	ndow II ve	105.5		ı formula 1	/[/1/ L volu	(0) 1 0 041 6	ne givon in	naraaranh	2.2	(3
* include the area						ateu using	i ioiiiiuia i	/[(1/ U- valu	(C)+0.04] a	is giveir iii	i paragrapri	3.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				28.47	(3:
Heat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	1042.46	(34
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Medium	Ī	250	(3
	ments wh	ere the de	tails of the	constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
or design assess		tailed calcı	ılation.			,					г		_
an be used inste						<					Ĺ	5.28	(3
can be used inste Thermal bridge	es : S (L	x Y) cal		• .	•	`							
can be used inste Thermal bridge f details of therma	es : S (L al bridging	x Y) cal		• .	•	`		(33) +	(36) =		Γ	33 74	
can be used inste Thermal bridge f details of therma Total fabric he	es : S (L al bridging at loss	x Y) cal	own (36) =	= 0.05 x (3	•	`			(36) = = 0.33 × (25)m x (5	[33.74	(37
can be used inste Thermal bridge of details of therma Total fabric he dentilation hea	es:S(L al bridging at loss at loss ca	x Y) cal	own (36) =	= 0.05 x (3	1)		Aua	(38)m	= 0.33 × (33.74	(37
For design assess can be used inste Thermal bridge of details of therma Total fabric he Ventilation hea Jan 38)m= 30.94	es : S (L al bridging at loss	x Y) cal	own (36) =	= 0.05 x (3	•	Jul 29.31	Aug 29.2			25)m x (5 Nov 30.13	Dec 30.39	33.74	(37
Fan be used instermal bridger feetails of thermal fotal fabric head of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the feetails of the fee	es : S (L al bridging at loss at loss ca Feb 30.8	x Y) calcare not known alculated Mar 30.66	own (36) = monthly Apr	- 0.05 x (3 / May	Jun	Jul	-	(38)m Sep 29.53	= 0.33 × (Oct 29.88	Nov 30.13	Dec	33.74	
can be used inste Thermal bridge f details of therma Total fabric he Ventilation hea	es : S (L al bridging at loss at loss ca Feb 30.8	x Y) calcare not known alculated Mar 30.66	own (36) = monthly Apr	- 0.05 x (3 / May	Jun	Jul	-	(38)m Sep 29.53	= 0.33 × (Nov 30.13	Dec	33.74	

Heat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
40)m= 1.17	1.17	1.17	1.16	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16		
Number of day	e in moi	oth (Tah	le 1a)		•	•	•	,	Average =	Sum(40) ₁ .	12 /12=	1.16	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		84		(42)
Annual averag Reduce the annua not more that 125	e hot wa I average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.91		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	litres per	day for ea	ach month		ctor from T	Table 1c x	(43)						
44)m= 85.7	82.58	79.47	76.35	73.23	70.12	70.12	73.23	76.35	79.47	82.58	85.7		— (44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		934.88	(44)
45)m= 127.09	111.15	114.7	100	95.95	82.8	76.72	88.04	89.09	103.83	113.34	123.08		
									Total = Su	m(45) ₁₁₂ =		1225.78	(45)
f instantaneous w										<u>-</u>			(40)
46)m= 19.06 Water storage	16.67 loss:	17.2	15	14.39	12.42	11.51	13.21	13.36	15.57	17	18.46		(46)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
f community h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)				'		
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Nater storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
, remperature fa					`	3,					54		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact			-										(- .)
Hot water stora f community h	•			e z (KVV	n/iitre/da	ıy)					0		(51)
/olume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,								0.	75		(55)
Nater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m 				
56)m= 23.33	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendi	ix H	(56
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
لـــــــا Primary circuit			m Table	<u> </u>			<u> </u>	<u> </u>	I	ļ	0		(58)
Primary circuit	loss cal	culated f	for each	month (•	. ,	, ,				~]		(55)
(modified by					ı —	ı —		-		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 I	loss cal	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)	ım						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	1 134.18	150.42	158.43	169.67		(62)
Solar DH	W 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 ad	ditional	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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
(64)m=	173.68	153.24	161.29	145.09	142.54	127.89	123.32	134.64	134.18	150.42	158.43	169.67		_
								Οι	utput from wa	ater heate	r (annual)₁	12	1774.4	(64)
Heat ga	ains fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	79.53	70.63	75.41	69.32	69.18	63.6	62.79	66.55	65.7	71.8	73.76	78.2		(65)
includ	de (57)r	n in calc	culation o	of (65)m	only if o	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a):									
Metabo	lic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01	92.01		(66)
Ligh <mark>ting</mark>	g gains	(calcu <mark>la</mark>	ted in Ap	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	14.88	13.21	10.74	8.13	6.08	5.13	5.55	7.21	9.68	12.29	14.34	15.29		(67)
Applian	i <mark>ce</mark> s gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1:	3a), als	so see Ta	ble 5				
(68)m=	16 0.44	162.11	157.91	148.98	137.71	127.11	120.03	118.37	122.56	131.49	142.77	153.36		(68)
Cooking	g gains	(calcula	ited in A	pendix	L, equat	ion L15	or L15a)	, also	see Table	5				
(69)m=	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		(69)
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61	-73.61		(71)
Water h	neating	gains (T	able 5)											
(72)m=	106.9	105.1	101.36	96.28	92.98	88.34	84.39	89.45	91.25	96.5	102.44	105.11		(72)
Total in	nternal	gains =	1			(66)	m + (67)m	+ (68)m	n + (69)m + ((70)m + (7	'1)m + (72)	m		
(73)m=	335.82	334.02	323.62	307	290.37	274.19	263.57	268.63	3 277.09	293.89	313.16	327.36		(73)
6. Sola	ar gains	:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	ion.		
Orienta		ccess Fable 6d	actor	Area m²		Flu Tal	x ole 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
West	_							-					` '	7,000
West	0.9x	0.77	X	4.1		-	9.64	X	0.63		0.7	=	24.97	(80)
West	0.9x	0.77	x	4.8			9.64	X	0.63		0.7	=	28.81	(80)
West	0.9x	0.77	X	4.1		-	88.42	X	0.63		0.7	=	48.85	(80)
44G91	0.9x	0.77	Х	4.8	В	x 3	88.42	X	0.63	x	0.7	=	56.36	(80)

			_		_		_						
West	0.9x	0.77	X	4.16	X	63.27	X	0.63	X	0.7	=	80.44	(80)
West	0.9x	0.77	X	4.8	X	63.27	X	0.63	X	0.7	=	92.82	(80)
West	0.9x	0.77	X	4.16	X	92.28	X	0.63	X	0.7	=	117.32	(80)
West	0.9x	0.77	X	4.8	X	92.28	X	0.63	X	0.7	=	135.37	(80)
West	0.9x	0.77	X	4.16	X	113.09	X	0.63	x	0.7	=	143.78	(80)
West	0.9x	0.77	X	4.8	X	113.09	X	0.63	x	0.7	=	165.9	(80)
West	0.9x	0.77	X	4.16	x	115.77	X	0.63	x	0.7	=	147.18	(80)
West	0.9x	0.77	X	4.8	x	115.77	X	0.63	X	0.7	=	169.83	(80)
West	0.9x	0.77	X	4.16	x	110.22	X	0.63	x	0.7	=	140.13	(80)
West	0.9x	0.77	X	4.8	x	110.22	X	0.63	×	0.7	=	161.68	(80)
West	0.9x	0.77	X	4.16	x	94.68	X	0.63	X	0.7	=	120.37	(80)
West	0.9x	0.77	X	4.8	x	94.68	X	0.63	x	0.7	=	138.88	(80)
West	0.9x	0.77	X	4.16	x	73.59	X	0.63	x	0.7	=	93.56	(80)
West	0.9x	0.77	X	4.8	x	73.59	X	0.63	X	0.7	=	107.95	(80)
West	0.9x	0.77	X	4.16	X	45.59	X	0.63	x	0.7	=	57.96	(80)
West	0.9x	0.77	x	4.8	x	45.59	X	0.63	X	0.7	=	66.88	(80)
West	0.9x	0.77	x	4.16	x	24.49	X	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	X	4.8	X	24.49	Х	0.63	X	0.7		35.92	(80)
West	0.9x	0.77	x	4.16	x	16.15	x	0.63	X	0.7		20.53	(80)
West	0.9x	0.77	x	4.8	х	16.15] x	0.63	x	0.7		23.69	(80)
							7						
			-4	for sook wood	th		(92\m	n = Sum(74)m	(92)m				
Solar g	ains in	watts, calcu	ated	for each thor	ILIN		(03)11	1 = 3um(74)m	.(02)111			_	
Solar g (83)m=	53.78		3.26	252.69 309.6		17.01 301.81	259		124.8	_	44.23		(83)
(83)m=	53.78	105.21 173	3.26		8 3		Ť			_	44.23		(83)
(83)m=	53.78	105.21 173 nternal and s	3.26	252.69 309.6	n + (Ť	.25 201.51		4 67.06	44.23 371.59]	(83)
(83)m= Total g	5 <mark>3.78</mark> ains — ii 389.6	105.21 173 nternal and s 439.23 496	3.26 solar 5.88	$\begin{array}{c c} 252.69 & 309.6 \\ \hline (84)m = (73)i \end{array}$	n + (83)m , watts	259	.25 201.51	124.8	4 67.06]	, ,
(83)m= Total g (84)m= 7. Mea	53.78 ains — ii 389.6 an inter	105.21 173 nternal and s 439.23 496 nal tempera	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seas	n + (on)	83)m , watts	259 527	.88 478.6	124.8	4 67.06		21	, ,
Total g (84)m= 7. Mea	53.78 ains — ir 389.6 an inter erature	105.21 173 nternal and s 439.23 496 nal tempera during heati	3.26 solar 5.88 ture (252.69 309.6 (84)m = (73)i 559.69 600.0 (heating seas	08 3 m + (05 8 on)	83)m , watts 91.2 565.38 area from Ta	259 527	.88 478.6	124.8	4 67.06		21	(84)
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(83)m= Total g (84)m= 7. Mean (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	53.78 ains – ii 389.6 an inter erature tion fac Jan 1 interna 19.83 erature 19.94 tion fac 0.99 interna 18.39 interna 19.07	105.21 173 nternal and s 439.23 496 nal temperal during heati tor for gains Feb N 0.99 0. I temperatur 19.94 19 tor for gains 0.99 0. I temperatur 18.61 18 I temperatur 19.25 19	3.26 solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar solar	252.69 309.6 (84)m = (73)i 559.69 600.0 heating seaseriods in the I ving area, h1 Apr Ma 0.94 0.83 iving area T1 20.58 20.8 eriods in rest 19.95 19.90 est of dwelling 0.91 0.77 he rest of dwelling 19.47 19.8	on) iving ,m (s y (follo 4	area from Ta ee Table 9a) Jun Jul 0.65 0.48 w steps 3 to 20.96 20.99 velling from Ta 9.96 19.96 m (see Table 0.56 0.37 T2 (follow ste 9.94 19.96	259 527 ble 9 A 0.5 7 in T 20. able 9 19	25 201.51 .88 478.6 .88 478.6 .89 Color .89 Color .89 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80 Color .80	124.8 418.7 Oct 0.96 20.56 19.96 0.94 9 9c) 19.46 A = Li	4 67.06 3 380.21 Nov 0.99 20.13 19.95 0.99 18.84 ving area ÷ (371.59 Dec 1 19.8 19.95		(84) (85) (86) (87) (88) (89)

	9.04 (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 the utilisation factor for gains using Table 9a	e-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains, hm:	500
(94)m= 0.99 0.99 0.97 0.91 0.79 0.6 0.43 0.48 0.75 0.94 0.99	.99 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	9.48 (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	1.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 955.18 926.41 842.45 707.2 546.66 367.27 242.68 254.72 396.54 596.52 788.88 9	1.45 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
Total per year (kWh/year) = Sum(98)-	912 = 2097.63 (98)
Space heating requirement in kWh/m²/year	38.07 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1 (204)
Efficiency of main space heating system 1	93.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec kWh/year
Space heating requirement (calculated above)	
422.83 331.29 268.64 140.79 52.92 0 0 0 0 150.19 297.99	2.99
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
	3.09
Total (kWh/year) =Sum(211) _{15,1012} =	2243.46 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)]} x 100 ÷ (208)	
(215)m= 0 0 0 0 0 0 0 0 0 0 0	0
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)
Water heating	
Output from water heater (calculated above)	
	9.67
Efficiency of water heater	79.8 (216)
	7.21 (217)
Fuel for water heating, kWh/month	
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 199.41 176.5 187.19 171.23 172.91 160.26 154.53 168.72 168.15 177.37 183.21 172.91 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183.21 183$	4.56
Total = Sum(219a) ₁₁₂ =	2114.03 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	- NVVII/y Cai
opace ricating faci asca, main system i	2243.46

					_
Water heating fuel used				2114.03	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				262.71	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			4695.2	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	484.59	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	456.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			941.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	136.34	(268)
Total CO2, kg/year TER =	sum	n of (265)(271) =		20.26	(272)

Property Details: Sample 7 (Top)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

Storey height:

Floor 0 66.3 m² 3 m

Living area: 23 m² (fraction 0.347)

Front of dwelling faces: Unspecified

Opening types:

Name	e: Source:	Type:	Glazing:	Argon:	F <mark>rame</mark> :
DOOR	Manufactur	er Solid			Wood
Balcon	y Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	
N	Manufactur	er Windows	low-E, En = 0.05	s, soft coat No	
E	Manufactur	er Windows	low-E, $En = 0.05$	s, soft coat No	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
Balcony		0.7	0.4	1	4.8	1
N		0.7	0.4	1	5.44	1
F		0.7	0.4	1	1.44	1

Name: DOOR	Type-Name:	Location: INT	Orient: Worst case	Width: 0	Height: 0
Balcony		N	North	0	0
N		N	North	0	0
E		Е	East	0	0

Overshading: Heavy

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Eleme	<u>ents</u>						
N	10.24	10.24	0	0.15	0	False	N/A
E	1.44	1.44	0	0.15	0	False	N/A
INT	13.2	2.4	10.8	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
Roof	66.3	0	66.3	0.11	0		N/A

Internal Elements
Party Elements

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2

Main heating system:

Pressure test:

Main heating system: Community heating schemes

3

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.6 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South

Assess Zero Carbon Home: No

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20			Strom Softwa	are Ve	rsion:		Versio	on: 1.0.5.51	
		Р	roperty	Address	Sample	e 7 (Top)			
Address: 1. Overall dwelling dime	oncione:									
1. Overall dwelling diffe	#11310113.		Δre	a(m²)		Δv He	eight(m)		Volume(m	3)
Ground floor					(1a) x		3	(2a) =	198.9) (3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	66.3	(4)			J		
Dwelling volume		-,	′	00.0)+(3c)+(3c	d)+(3e)+	(3n) =	198.9	(5)
							, , ,		190.9	(0)
2. Ventilation rate:		secondar	у	other		total			m³ per hou	ır
Number of chimneys	heating	heating 0	7 + [0	7 = [0	x	40 =	0	(6a
Number of open flues	0 +	0	┧╻┝	0]	0	x	20 =	0	(6b)
·		0	J . L	0				10 =		╡`
Number of intermittent fa					L	0			0	(7a)
Number of passive vents					L	0		10 =	0	(7b)
Number of flueless gas fi	ires					0	X	40 =	0	(7c
								Δir ch	nanges per h	our
Infiltration due to chimne	vo fluor and fans – ((63)+(6b)+(7	7a)+(7b)+(70) -	_		_			_
If a pressurisation test has b					continue fi	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in the						(2)	-/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0					•	ruction			0	(11
if both types of wall are p deducting areas of openi	resent, use the value corre nas): if equal user 0.35	esponding to	the great	ter wall are	a (after					
If suspended wooden	• , .	aled) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en	ter 0.05, else enter 0								0	(13
Percentage of window	s and doors draught :	stripped							0	(14
Window infiltration				0.25 - [0.2					0	(15
Infiltration rate				(8) + (10)	. , , ,	, , ,	, ,		0	(16
Air permeability value, If based on air permeabil	•		•	•	•	etre of e	envelope	area	3	(17
Air permeability value applie	•					is beina u	ısed		0.15	(18
Number of sides sheltere		ac 200 ac.		y. 00 a po		io somig a			2	(19
Shelter factor				(20) = 1 -	[0.0 75 x (19)] =			0.85	(20
Infiltration rate incorporat	ting shelter factor			(21) = (18) x (20) =				0.13	(21
Infiltration rate modified f	or monthly wind spee	ed					_		_	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	eed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2\m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
	1 1.00	1 5.55							J	

djusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
<i>Calculate effec</i> If mechanica		-	rate for t	пе аррп	саріе са	se						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)		
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	иV) (24b	m = (22)	2b)m + (23b)		l	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho				•	•				.5 × (23b	o)	•	•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v					•				0.5]			ı	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)		-		•	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss r	naramete	or.					_	_			
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
oo <mark>rs</mark>					2.4	x	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				4.8	X	1/[1/(1)+	0.04] =	4.62	Ħ			(27
Vindows Type	2				5.44	X	1/[1/(1)+	0.04] =	5.23				(27
Vindows Type	3				1.44	X	1/[1/(1)+	0.04] =	1.38				(27
Valls Type1	10.2	24	10.24	4	0	x	0.15	─ - i	0	= [(29
Valls Type2	1.4	4	1.44		0	x	0.15	= i	0	Ħ i		7 F	(29
Valls Type3	13.:	2	2.4		10.8	x	0.15	<u> </u>	1.62	F i		7 F	(29
Valls Type4	2.4		0		2.4	X	0.35	<u> </u>	0.84			7 F	(29
Roof	66.3		0	=	66.3	x	0.11	╡┇	7.29	≓ i		-	(30
otal area of el	ements	 , m²			93.58								(3
for windows and a					alue calcul		g formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	3.2	,
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				24.34	(33
leat capacity (Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	781.5	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assessi an be used instea				construct	ion are no	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						14.04	(30
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			38.38	(3:
entilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		

	1	·	i			i	ı				•	l	4
(38)m= 17.55	17.34	17.13	16.08	15.87	14.83	14.83	14.62	15.24	15.87	16.29	16.71		(38)
Heat transfer		· · · · ·	1			1		· · · ·	= (37) + (I	
(39)m= 55.92	55.71	55.5	54.46	54.25	53.2	53.2	52.99	53.62	54.25	54.67	55.09		7 (20)
Heat loss par	ameter (I	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	54.41	(39)
(40)m= 0.84	0.84	0.84	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83		_
Number of da	vs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.82	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•	•								•	•	'	
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ	unancv	N									45		(40)
if TFA > 13 if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		.15		(42)
Annual avera	ge hot wa										5.34		(43)
Reduce the annu	•		0 ,		•	Ū	to achieve	a water us	se target o	f		•	
			<u> </u>			<u> </u>	Aug	Con	Oct	Nov	Doo		
Jan Hot water usage	in litres per	Mar r day for ea	Apr ach month	May $Vd, m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 93.87	90.46	87.04	83.63	80.22	76.8	76.8	80.22	83.63	87.04	90.46	93.87		
(11)	300	0,101	00.00	00.22	1 0.0		00.22			m(44) ₁₁₂ =		1024.02	(44)
Ener <mark>gy cont</mark> ent o	f hot wa <mark>ter</mark>	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	OTm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m= 139.2	121.75	125.63	109.53	105.1	90.69	84.04	96.44	97.59	113.73	124.14	134.81		_
If instantaneous	water heati	na at noint	of use (no	hot water	storage)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1342.66	(45)
(46)m= 20.88	18.26	18.85	16.43	15.76	13.6	12.61	14.47	14.64	17.06	18.62	20.22		(46)
Water storage	1	10.05	10.43	13.70	13.0	12.01	14.47	14.04	17.00	10.02	20.22		(10)
Storage volun	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	•			•			` '						
Otherwise if n		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		eclared I	oss facto	or is kno	wn (kWh	n/dav):					0		(48)
Temperature					`	, , ,					0		(49)
Energy lost from				ear			(48) x (49)	=			10		(50)
b) If manufac			-										
Hot water sto	-			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community Volume factor	•		on 4.3							1	.03		(52)
Temperature			2b							-	0.6		(52)
Energy lost from	om water	r storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		.03		(54)
Enter (50) or		_	,				, , , , ,	, , ,	•		.03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = (55) × (41)r	m			•	
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fron	m Table 3							0		(58)
Primary circuit loss calculated for		59)m = (5	58) ÷ 365	× (41)ı	m				•	
(modified by factor from Table	H5 if there is s	olar wate	er heating	g and a	cylinder	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 calculated for each r	month (61)m = ((60) ÷ 365	5 × (41)m	n						
(61)m= 0 0 0	0 0	0	0	0	0	0	0	0		(61)
Total heat required for water hea	ating calculated	for each	month (6	62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.48 171.68 180.91	163.02 160.37	144.18	139.32	151.71	151.08	169.01	177.64	190.09		(62)
Solar DHW input calculated using Apper	ndix G or Appendix	H (negative	e quantity)	(enter '0'	if no solar	contribut	ion to wate	r heating)		
(add additional lines if FGHRS a	and/or WWHRS	applies,	see Appe	endix G	6)					
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0		(63)
FHRS 17.95 15.97 16.42	14.51 13.97	12.12	11.22	12.87	13.02	15.02	16.25	17.46		(63) (G2
Output from water heater										
(64)m= 173.85 153.29 161.81	145.92 143.72	129.47	125.41	136.16	135.46	151.3	158.8	169.95		
		-	-	Outp	ut from wa	ater heate	r (annual) ₁	12	1785.13	(64)
Heat gains from water heating, k	kWh/month 0.25	5´[0.85 ×	< (45)m +	⊦ (61)m] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 90.51 80.42 85.99	79.21 79.17	72.95	72.16	76.29	75.24	82.04	84.07	89.05		(65)
include (57)m in calculation of	f (65)m only if cy	ylinder is	in the dv	velling	or hot wa	ate <mark>r is</mark> fi	rom com	munity h	eating	
5. Internal gains (see Table 5	and 5a):									
Metabolic gains (Table 5), Watts	6									
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 107.65 107.65 107.65	107.65 107.65	107.65	107.65	107.65	107.65	107.65	107.65	107.65		(66)
Lighting gains (calculated in App	oendix L, equati	on L9 or	L9a), als	o see T	Table 5					
(67)m= 17.67 15.69 12.76	9.66 7.22	6.1	6.59	8.56	11.49	14.59	17.03	18.16		(67)
Appliances gains (calculated in A	Appendix L, equ	uation L1:	3 or L13a	a), also	see Tal	ole 5			•	
(68)m= 188.51 190.47 185.54	175.04 161.8	149.35	141.03	139.07	144	154.5	167.74	180.19		(68)
Cooking gains (calculated in App	pendix L, equati	ion L15 o	r L15a),	also se	e Table	5			•	
(69)m= 33.77 33.77 33.77	33.77 33.77	33.77	33.77	33.77	33.77	33.77	33.77	33.77		(69)
Pumps and fans gains (Table 5a	a)	=	=	-	-		-		•	
(70)m= 0 0 0	0 0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporation (negative	ve values) (Tab	le 5)	-	•			•		•	
(71)m= -86.12 -86.12 -86.12	-86.12 -86.12	-86.12	-86.12	-86.12	-86.12	-86.12	-86.12	-86.12		(71)
Water heating gains (Table 5)		-	-				-		•	
(72)m= 121.65 119.68 115.58	110.02 106.41	101.32	97	102.54	104.5	110.26	116.77	119.69		(72)
Total internal gains =		(66)m	n + (67)m +	+ (68)m +	(69)m + (70)m + (7	'1)m + (72)	m	•	
(73)m= 383.12 381.13 369.18	350.02 330.72	312.06	299.91	305.47	315.3	334.65	356.84	373.33		(73)
6. Solar gains:			•	·						
Solar gains are calculated using solar f	flux from Table 6a a	and associa	ted equation	ons to co	nvert to the	e applicat	ole orientat	ion.		
Orientation: Access Factor	Area	Flux		-	g_	-	FF		Gains	
Table 6d	m²	ıabı	le 6a		able 6b	, , –	able 6c		(W)	_
North 0.9x 0.77 x	4.8	x 10	.63	X	0.4	x	0.7	=	9.9	(74)

North	0.9x	0.77	X	5.44	X	10.6	3	X	0.4	x	0.7	=	11.22	(74)
North	0.9x	0.77	X	4.8	X	20.3	2	x	0.4	x	0.7	=	18.93	(74)
North	0.9x	0.77	X	5.44	X	20.3	2	x	0.4	х	0.7	=	21.45	(74)
North	0.9x	0.77	X	4.8	X	34.5	3	x	0.4	x	0.7	=	32.16	(74)
North	0.9x	0.77	x	5.44	X	34.5	3	x	0.4	x	0.7	_ =	36.45	(74)
North	0.9x	0.77	x	4.8	×	55.4	6	x	0.4	x	0.7		51.66	(74)
North	0.9x	0.77	X	5.44	x	55.4	6	x	0.4	x	0.7	=	58.55	(74)
North	0.9x	0.77	x	4.8	x	74.7	2	x	0.4	x	0.7	=	69.59	(74)
North	0.9x	0.77	x	5.44	×	74.7	2	x	0.4	x	0.7		78.87	(74)
North	0.9x	0.77	X	4.8	x	79.9	9	x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	x	5.44	x	79.9	9	x	0.4	x	0.7		84.43	(74)
North	0.9x	0.77	x	4.8	×	74.6	8	x	0.4	x	0.7	<u> </u>	69.55	(74)
North	0.9x	0.77	X	5.44	x	74.6	8	x	0.4	x	0.7	=	78.83	(74)
North	0.9x	0.77	X	4.8	x	59.2	5	x	0.4	x	0.7	=	55.18	(74)
North	0.9x	0.77	X	5.44	X	59.2	5	x	0.4	x	0.7	=	62.54	(74)
North	0.9x	0.77	X	4.8	x	41.5	2	x	0.4	×	0.7	=	38.67	(74)
North	0.9x	0.77	X	5.44	x	41.5	2	x	0.4	x	0.7	=	43.82	(74)
North	0.9x	0.77	X	4.8	X	24.1	9	Х	0.4	Х	0.7	=	22.53	(74)
North	0.9x	0.77	j×	5.44	j x	24.1	9	х	0.4	x	0.7		25.53	(74)
North	0.9x	0.77	X	4.8	х	13.1	2	×	0.4	х	0.7	=	12.22	(74)
North	0.9x	0.77	×	5.44	X	13.1	2	x	0.4	x	0.7	=	13.85	(74)
North	0.9x	0.77	j×	4.8	x	8.86		Х	0.4	x	0.7		8.26	(74)
North	0.9x	0.77	x	5.44	x	8.86	5 /	Х	0.4	х	0.7	_ =	9.36	(74)
East	0.9x	0.77	X	1.44	х	19.6	4	x	0.4	x	0.7		5.49	(76)
East	0.9x	0.77	X	1.44	×	38.4	2	x	0.4	x	0.7	=	10.74	(76)
East	0.9x	0.77	X	1.44	X	63.2	7	x	0.4	x	0.7	=	17.68	(76)
East	0.9x	0.77	X	1.44	X	92.2	8	x	0.4	×	0.7	=	25.78	(76)
East	0.9x	0.77	j x	1.44	X	113.0	9	x	0.4	x	0.7	=	31.6	(76)
East	0.9x	0.77	X	1.44	X	115.7	77	x	0.4	×	0.7	=	32.35	(76)
East	0.9x	0.77	X	1.44	X	110.2	22	x	0.4	x	0.7		30.8	(76)
East	0.9x	0.77	j x	1.44	X	94.6	8	x	0.4	x	0.7	=	26.45	(76)
East	0.9x	0.77	X	1.44	X	73.5	9	X	0.4	×	0.7	= =	20.56	(76)
East	0.9x	0.77	X	1.44	X	45.5	9	X	0.4	x	0.7	= =	12.74	(76)
East	0.9x	0.77	X	1.44	X	24.4	9	x	0.4	×	0.7	=	6.84	(76)
East	0.9x	0.77	X	1.44	X	16.1	5	X	0.4	×	0.7	= =	4.51	(76)
	_		_		_									_
Solar g	ains in v	watts, calcu	lated	for each mon	th		((83)m	ı = Sum(74)m	(82)m				
(83)m=	26.62	51.11 86	5.29	135.99 180.0	6 1	91.28 17	79.18	144	.17 103.05	60.8	32.91	22.13		(83)
Total ga	ains – ir	ternal and	solar	(84)m = (73) r	n + (83)m , w	atts						•	
(84)m=	409.74	432.25 45	5.47	486.01 510.7	8 5	03.34 47	79.08	449	.64 418.35	395.45	389.75	395.46		(84)
7. Mea	an interr	nal tempera	ture (heating seaso	on)									
Tempe	erature	during heat	ing pe	eriods in the li	ving	area fror	m Tab	le 9,	Th1 (°C)				21	(85)
Utilisa	tion fact	tor for gains	for li	ving area, h1	,m (s	ee Table	9a)					<u></u>		_
	Jan	Feb N	Лar	Apr Ma	у	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
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		_	
(86)m= 1 1 0.99 0.96 0.86 0.66 0.49 0.54 0.81 0.97 0.9	9 1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)			
(87)m= 20.21 20.3 20.47 20.71 20.9 20.99 21 21 20.95 20.73 20.	14 20.2		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)			
(88)m= 20.22 20.22 20.22 20.23 20.24 20.25 20.25 20.25 20.25 20.24 20.	23 20.23		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)			
(89)m= 1 0.99 0.99 0.95 0.82 0.59 0.4 0.45 0.75 0.96 0.9	9 1		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	-	•	
(90)m= 19.16 19.29 19.53 19.89 20.14 20.24 20.25 20.25 20.21 19.92 19	5 19.15]	(90)
fLA = Living area	i ÷ (4) =	0.35	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$			
(92)m= 19.52 19.64 19.86 20.17 20.41 20.5 20.51 20.51 20.47 20.2 19.	33 19.52]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		1	
(93)m= 19.52 19.64 19.86 20.17 20.41 20.5 20.51 20.51 20.47 20.2 19.	33 19.52		(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-cald	culate	
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct N	ov Dec		
Utilisation factor for gains, hm:	JV Dec	J	
(94)m= 1 0.99 0.98 0.95 0.83 0.61 0.43 0.48 0.77 0.96 0.95	9 1]	(94)
Useful gains, hmGm , W = (94)m x (84)m		1	
(95)m= 407.88 429.08 447.99 460.21 425.51 309 207.61 217.04 321.2 378.12 385	99 394.01		(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.	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m]	74 040 00	1	(07)
(97)m= 851.32 821.11 741.41 614 472.37 313.96 208.03 217.86 341.42 520.76 695	74 843.66]	(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ $(98)m = 329.92 \ 263.45 \ 218.31 \ 110.73 \ 34.86 \ 0 \ 0 \ 0 \ 0 \ 106.12 \ 223$	02 334.54	1	
Total per year (kWh/year) = Su		1620.95	(98)
Space heating requirement in kWh/m²/year	(00)10,312		(99)
<u> </u>		24.45	(55)
9b. Energy requirements – Community heating scheme	a a b a ma a		
This part is used for space heating, space cooling or water heating provided by a community Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	scrieme.	0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other in	noat sources:		(552)
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	ieat sources, t	ne 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 heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating Annual space heating requirement		kWh/yea	ai
p doo		1020.00	

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1701.99	(307a)
Efficiency of secondary/supplementary heating system in % (from		0](308
Space heating requirement from secondary/supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically supplementary systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematically systematic	,	0] (309)
			」` ′
Water heating Annual water heating requirement		1785.13	7
If DHW from community scheme:	(0.1) (000) (005) (000)		
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1874.39	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =		(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	$=(107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside	118.3	(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) =	118.3	(331)
Energy for lighting (calculated in Appendix L)		311.98	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+(315) + (331) + (332) (237b) =	3488.48	(338)
	(010) (001) (002)(2010) =	0 1001 10	(/
12b. CO2 Emissions – Community heating scheme	(002)(2013)	0.00.10	
	Energy Emission facto		
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP)	Energy Emission facto	r Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	Energy Emission facto kWh/year kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(Energy Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f	r Emissions kg CO2/year	(367a)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52	r Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x 0.52	r Emissions kg CO2/year	(367a) (367) (372)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307b)+(Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x	r Emissions kg CO2/year uel 256 = 725.06 = 18.56 = 743.62	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] × 100 ÷ (367b) × 0.52 [(313) × 0.52 (363)(366) + (368)(372) (309) × 0	r Emissions kg CO2/year uel 256 = 725.06 = 18.56 = 743.62 = 0	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	r Emissions kg CO2/year uel 256 = 725.06 = 18.56 = 743.62 = 0 = 0	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] × 100 ÷ (367b) × 0.52 [(313) × 0.52 (363)(366) + (368)(372) (309) × 0 eous heater (312) × 0.22 (373) + (374) + (375) =	r Emissions kg CO2/year 256 = 725.06 = 18.56 = 743.62 = 0 = 0 743.62	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for the second for	r Emissions kg CO2/year uel 256 = 725.06 = 18.56 = 743.62 = 0 = 0 743.62 = 61.4 = 161.92	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application.	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x	r Emissions kg CO2/year uel 256 = 725.06 = 18.56 = 743.62 = 0 = 0 743.62 = 61.4 = 161.92	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x	r Emissions kg CO2/year uel 256 = 725.06 = 18.56 = 743.62 = 0 = 0 743.62 = 61.4 = 161.92	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380)
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantane Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application Total CO2, kg/year sum of (376)(382) =	Energy kWh/year Emission factor kg CO2/kWh g two fuels repeat (363) to (366) for the second f (310b)] x 100 ÷ (367b) x	r Emissions kg CO2/year uel	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380) (383)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	2		Strom Softwa				Versic	on: 1.0.5.51	
		Pi	operty.	Address	: Sampl	е 7 (Тор)			
Address :										
1. Overall dwelling dime	nsions:									
Ground floor				a(m²) 66.3	(1a) x	Av. He	gight(m)	(2a) =	Volume(m ²	3) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)	+(1n) (66.3	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	198.9	(5)
2. Ventilation rate:										
Number of chimneys		condargeating	у 7 + Г	other 0	7 = F	total 0	x	40 =	m³ per hou	ır
Number of open flues]]			20 =		╡`
•		0	J ' L	0	J -	0			0	(6t
Number of intermittent far	ns				Ĺ	2		10 =	20	(7a
Number of passive vents					L	0	X	10 =	0	(7t
Number of flueless gas fin	res					0	X ·	40 =	0	(70
								Δir ch	nanges per he	our
Infiltration due to object	to fluor and fano (63)	a) ı (7b) ı (70) -			_			
Infilt <mark>ration due to chimney</mark> If a pressurisation test has be					continue f	20 from (9) to		÷ (5) =	0.1	(8)
Number of storeys in th		a, procee	- 10 (17),	ouror moo (10111 (0) 10	(70)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.	25 for steel or timber for	rame or	0.35 fo	r masonı	y const	ruction			0	(1
if both types of wall are pr deducting areas of openin	resent, use the value corresponds): if equal user 0.35	onding to	the great	ter wall are	a (after					
If suspended wooden f		ed) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	ter 0.05, else enter 0								0	(13
Percentage of windows	and doors draught str	ipped							0	(14
Window infiltration				0.25 - [0.2	. ,	-			0	(15
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16
Air permeability value,	·		•	•	•	netre of e	envelope	area	5	(17
f based on air permeabili	-					. :- 6 - :			0.35	(18
Air permeability value applies Number of sides sheltere		been aon	e or a deg	gree air pe	rmeability	r is being u	sea		2	(19
Shelter factor	u .			(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporat	ing shelter factor			(21) = (18) x (20) =				0.3	(21
Infiltration rate modified for	or monthly wind speed									
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7	·				•			•	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
All 15-11 (00) (22				•		•	-	•	•	
Wind Factor (22a)m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m = (22^{23}) m =	' 	0.05	0.05	0.00	4	1.00	1 40	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				•	
0.38	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35		
Calculate effect If mechanica			rate for t	пе арріі	саріе са	ise						0	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	heat recov	ery: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mechar	nical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	_	`
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mechar	nical ve	ntilation	without	heat red	covery (N	лV) (24b	m = (22)	2b)m + (2	23b)		l	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse extr			•	•				.5 × (23b))		•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilatior n = 1, ther				•				0.5]	•	•	1	
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		(24
Effective air	change ra	ate - er	nter (24a) or (24k	o) or (24	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		(2
3. Heat losse	s and hea	et loss r	paramete	jr.					_			_	
ELEMENT	Gross		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	AXk
	are <mark>a (</mark> ı	m²)	m	2	A ,r	m²	W/m2	2K	(W/I	<)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>					2.4	X	1		2.4				(2
Vindows Type	: 1				4.8	x1	/[1/(1.4)+	0.04] =	6.36	Ų			(2
Vindows Type	2				5.44	x1	/[1/(1.4)+	0.04] =	7.21	Ц			(2
Vindows Type	3				1.44	х1	/[1/(1.4)+	0.04] =	1.91				(2
Valls Type1	10.24		10.24	4	0	X	0.18	=	0				(2
Valls Type2	1.44		1.44		0	X	0.18	=	0				(2
Valls Type3	13.2		2.4		10.8	X	0.18	=	1.94	\Box [(2
Valls Type4	2.4		0		2.4	X	0.18	=	0.43				(2
Roof	66.3		0		66.3	X	0.13	=	8.62				(3
otal area of e	lements,	m²			93.58	3						_	(3
for windows and						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions		(26) (20) . (22) _					
abric heat los		,	U)				(26)(30	, , ,	(20) : (20	2) . (22-)	(20-)	28.88	
leat capacity	•	,	. Cm	T[. l. 1/m21/				(30) + (32	, , ,	(32e) =	781.5	
hermal mass or design assess	•	•		,			ecisaly the		tive Value		ahle 1f	250	(3
an be used instea				JOHSHUCL	ion ale 110	. KIOWII PI	ooiseiy uit	, maicanyt	, vaiu c s Ul	rivii III I (abic II		
hermal bridge	es : S (L x	(Y) cal	culated (using Ap	pendix I	K						4.68	(3
details of therma		re not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he									(36) =			33.56	(3
entilation hea	at loss cal		l monthly	/					= 0.33 × (25)m x (5)) 	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

						i	i			ī	i	1	
,	37.37	37.19	36.34	36.19	35.45	35.45	35.31	35.73	36.19	36.51	36.84	I	(38)
Heat transfer co								· · ·	= (37) + (3			l	
(39)m= 71.11	70.93	70.75	69.9	69.74	69.01	69.01	68.87	69.29	69.74	70.07	70.4	60.0	(39)
Heat loss param	neter (F	ILP), W/	m²K						= (39)m ÷	Sum(39) ₁ (4)	12 / 1 Z=	69.9	(39)
(40)m= 1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.04	1.05	1.05	1.06	1.06		-
Number of days	in mor	nth (Tabl	e 1a)					/	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heatin	ng ener	gy requi	rement:								kWh/ye	ear:	
Assumed occup	ancv. N	N								2	15		(42)
if TFA > 13.9, if TFA £ 13.9,	N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		10		(/
Annual average	hot wa										.34		(43)
Reduce the annual a	-		• •		-	-	to achieve	a water us	e target o	f			
Jan	Feb		,			Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in l		Mar day for ea	Apr ach month	Vd,m = fa	Jun		Aug (43)	Sep	Oct	INOV	Dec		
(44)m= 93.87	90.46	87.04	83.63	80.22	76.8	76.8	80.22	83.63	87.04	90.46	93.87		
									Γotal = Su	L m(44) ₁₁₂ =		1024.02	(44)
Energy content of ho	ot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		_
(45)m= 139.2	121.75	125.63	109.53	105.1	90.69	84.04	96.44	97.59	113.73	124.14	134.81		_
If instantaneous wat	ter heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =	=	1342.66	(45)
	18.26	18.85	16.43	15.76	13.6	12.61	14.47	14.64	17.06	18.62	20.22		(46)
Water storage lo		.0.00	.00							10.02			` ,
Storage volume	(litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	_			_			, ,	\	(0): (47)			
Otherwise if no s Water storage lo		not wate	er (tnis in	iciuaes i	nstantar	neous co	mbi boli	ers) ente	er o'in (47)			
a) If manufactur		eclared le	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Temperature fac	ctor fro	m Table	2b							0.	54		(49)
Energy lost from	n water	storage	, kWh/ye	ear			(48) x (49)	=		0.	75		(50)
b) If manufactur			-									1	(= 4)
Hot water storage If community her				e z (KVVI	n/iitre/da	ıy)					0	i	(51)
Volume factor from	-										0		(52)
Temperature fac	ctor fro	m Table	2b								0		(53)
Energy lost from	n water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (54	4) in (5	55)								0.	75		(55)
Water storage lo	oss cal	culated f	or each	month			((56)m = (55) × (41)r	n				
` '	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	<u> </u>	(56)
If cylinder contains d	dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	()m = (56)	m where (H11) is fro	m Append	ıx H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	I	(57)

Primary circuit loss calnually from Table 1-5 if there is solar water heating and a cylinder thermostat) Combileos calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) Combileos calculated for each month (69)m = (60) + 365 × (41)m Combileos calculated for each month (61)m = (60) + 365 × (41)m Combileos calculated for each month (61)m = (60) + 365 × (41)m Combileos calculated for each month (62)m = (30) + 365 × (41)m Combileos calculated for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m Combileos calculated considered calculated considered calculated considered calculated considered calculated considered calculated considered calculated considered calculated considered calculated considered calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated calculated								
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(72)m= 112.31 110.34 106.25 100.68 97.07 91.98 87.66 93.2 95.17 100.93 107.43 110.35 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 376.35 374.41 362.53 343.44 324.21 305.57 293.41 298.92 308.67 327.95 350.08 366.55 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Table 6d Flux Gains Table 6b Table 6c (W)	(71)m= -86.12 -86.12 -86.12	-86.12 -86.12	-86.12 -86.12	-86.12 -86.12	-86.12 -86.12	-86.12		(71)
Total internal gains =	Water heating gains (Table 5)		,	,				
(73)m= 376.35 374.41 362.53 343.44 324.21 305.57 293.41 298.92 308.67 327.95 350.08 366.55 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Table 6d Flux g_ FF Gains Table 6c (W)	(72)m= 112.31 110.34 106.25	100.68 97.07	91.98 87.66	93.2 95.17	100.93 107.43	110.35		(72)
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)	Total internal gains =		(66)m + (67)	m + (68)m + (69)m +	(70)m + (71)m + (72)m	•	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)	(73)m= 376.35 374.41 362.53	343.44 324.21	305.57 293.41	298.92 308.67	327.95 350.08	366.55	1	(73)
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)	6. Solar gains:			· ·	'			
Table 6d m ² Table 6a Table 6b Table 6c (W)	Solar gains are calculated using sola	ar flux from Table 6a a	and associated equ	uations to convert to the	he applicable orienta	tion.		
North 0.9x 0.77 x 4.8 x 10.63 x 0.63 x 0.7 = 15.6 (74)								
	North 0.9x 0.77 x	4.8	x 10.63	x 0.63	x 0.7	=	15.6	(74)

	_								_						
North	0.9x	0.77)	(5.44	X	10.63	3	X	0.63	X	0.7	=	17.68	(74)
North	0.9x	0.77	,	· [4.8	X	20.32	2	X	0.63	X	0.7	=	29.81	(74)
North	0.9x	0.77)	· [5.44	X	20.32)	x	0.63	X	0.7	=	33.78	(74)
North	0.9x	0.77)	· [4.8	x	34.53	3	X	0.63	X	0.7	=	50.65	(74)
North	0.9x	0.77)	ζ [5.44	x	34.53	3	x	0.63	X	0.7	=	57.41	(74)
North	0.9x	0.77	,	, [4.8	x	55.46	5	X	0.63	x	0.7	=	81.36	(74)
North	0.9x	0.77)	(5.44	x	55.46	6	x	0.63	X	0.7	=	92.21	(74)
North	0.9x	0.77)	(4.8	x	74.72)	x	0.63	X	0.7	=	109.6	(74)
North	0.9x	0.77)	(5.44	x	74.72	2	x	0.63	X	0.7	=	124.22	(74)
North	0.9x	0.77)	(4.8	x	79.99)	x	0.63	X	0.7	=	117.33	(74)
North	0.9x	0.77)	(5.44	x	79.99)	x	0.63	X	0.7	=	132.98	(74)
North	0.9x	0.77)	(4.8	x	74.68	3	x	0.63	X	0.7	=	109.55	(74)
North	0.9x	0.77)	(5.44	x	74.68	3	X	0.63	x	0.7	=	124.15	(74)
North	0.9x	0.77)	· [4.8	x	59.25	5	X	0.63	x	0.7	=	86.91	(74)
North	0.9x	0.77	,	, [5.44	x	59.25	5	X	0.63	x	0.7	=	98.5	(74)
North	0.9x	0.77)	(4.8	x	41.52	2	X	0.63	x	0.7	=	60.9	(74)
North	0.9x	0.77	,	, [5.44	x	41.52)	x	0.63	x	0.7	=	69.02	(74)
North	0.9x	0.77	,	(4.8	X	24.19)	Х	0.63	X	0.7	=	35.48	(74)
North	0.9x	0.77	,	([5.44	х	24.19		x	0.63	x	0.7		40.22	(74)
North	0.9x	0.77	,	([4.8	х	13.12	2 /	x	0.63	х	0.7	=	19.24	(74)
North	0.9x	0.77	,	(5.44	x	13.12		X	0.63	x	0.7	=	21.81	(74)
North	0.9x	0.77	,	([4.8	x	8.86		Х	0.63	x	0.7	=	13	(74)
North	0.9x	0.77	,	([5.44	×	8.86		X	0.63	x	0.7	=	14.74	(74)
East	0.9x	0.77	,	([1.44	х	19.64	. /	x	0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77	,	, <u> </u>	1.44	x	38.42)	x	0.63	x	0.7	=	16.91	(76)
East	0.9x	0.77	,	· [1.44	x	63.27	,	x	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77	,	· [1.44	x	92.28	3	x	0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77	,	, [1.44	x	113.0	9	x	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	,	, [1.44	x	115.7	7	x	0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77	,	, [1.44	x	110.2	2	x	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	,	, [1.44	x	94.68	3	x	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	,	, [1.44	x	73.59)	x	0.63	x	0.7		32.39	(76)
East	0.9x	0.77	,	, [1.44	x	45.59)	x	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	,	, [1.44	x	24.49)	x	0.63	x	0.7	=	10.78	(76)
East	0.9x	0.77	,	, [1.44	x	16.15	5	x	0.63	x	0.7	=	7.11	(76)
	_			-											_
Solar g	ains in	watts, ca	lculate	d f	or each mont	th			(83)m	= Sum(74)m	(82)m			_	
(83)m=	41.92	80.5	135.91		214.19 283.59			32.2	227	.08 162.31	95.76	51.83	34.85		(83)
Ī				Ť	84)m = (73) m	<u> </u>			ı					1	
(84)m=	418.27	454.91	498.43		557.63 607.8	6	06.83 57	5.61	525	99 470.98	423.7	401.91	401.39		(84)
7. Mea	an inter	nal temp	erature	e (h	neating seaso	n)									
Tempe	erature	during he	eating	ре	riods in the li	ving	area fron	n Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa <u></u>	tion fac	tor for ga	ains for	liv	ving area, h1,	m (s	ee Table	9a)				_			
	Jan	Feb	Mar		Apr May	/	Jun .	Jul	A	ug Sep	Oct	Nov	Dec		
01	0 4 D 004	0.1/	40554	رم	AD 0.02\ h#n://			_						D	5 of 7

													ı	
(86)m=	1	1	0.99	0.96	0.87	0.69	0.52	0.59	0.85	0.98	0.99	1		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.89	20.01	20.23	20.55	20.83	20.96	20.99	20.99	20.89	20.55	20.17	19.87		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	20.02	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.03		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)				-	•	
(89)m=	1	0.99	0.99	0.95	0.82	0.6	0.41	0.47	0.78	0.96	0.99	1		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	na T2 (fa	ollow ste	ens 3 to	7 in Tahl	e 9c)				
(90)m=	18.55	18.72	19.05	19.51	19.87	20.03	20.05	20.05	19.95	19.51	18.97	18.53		(90)
									l f	LA = Livin	g area ÷ (4	4) =	0.35	(91)
Moor	intorno	l tompor	oturo (fo	r tha wh	ala dwa	lling\ — fl	Λ Τ1	. /1 fl	۸) T2					
(92)m=	19.01	19.17	ature (fo	19.87	20.2	20.35	20.38	20.37	20.28	19.87	19.38	18.99		(92)
			he mean			<u> </u>		<u> </u>			10.00	10.00		(-)
(93)m=	19.01	19.17	19.46	19.87	20.2	20.35	20.38	20.37	20.28	19.87	19.38	18.99		(93)
	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ternal ter	nperatui	e obtair	ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u	tilisation	factor fo	or gains	using Ta	ble 9a								ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.00	0.00	0.45		0.0	0.00	0.00	4		(04)
(94)m=	1	0.99	0.98	0.94	0.83	0.63	0.45	0.51	0.8	0.96	0.99	1		(94)
(95)m=			, W = (94 489.45	526.23	506.4	382.38	258.62	269.85	377.5	407.76	398.32	399.9		(95)
			rnal tem				230.02	209.00	377.5	407.70	390.32	399.9		(30)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	e for mea	ı an intern		erature.	Lm . W =	L =[(39)m :	L x [(93)m			<u> </u>			
	1046.39		916.77	766.93	592.98	396.91	260.53	273.62	428.11	646.74	860.71	1041.48		(97)
Spac	e heatin	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=	468.76	376.71	317.92	173.3	64.42	0	0	0	0	177.8	332.92	477.33		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2389.15	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year								36.04	(99)
9a. En	erav rec	uiremer	nts – Indi	vidual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatir					,			,					
•		_	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Effici	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	-	•	ry/suppl			a svstem	າ. %						0	(208)
								۸۰۰۵	Con	Oot	Nov	Doo		`
Snac	Jan e heatin	Feb a require	Mar ement (c	Apr	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	y c ai
Opac	468.76	376.71	317.92	173.3	64.42	0	0	0	0	177.8	332.92	477.33		
(211)n			(4)] } x 1			<u> </u>		<u> </u>	L				I	(211)
(<u>~ 1 1)</u> [[501.34	402.9	340.02	185.35	68.89	0	0	0	0	190.16	356.06	510.51		(211)
									l (kWh/yea				2555.24	(211)

Space heating fuel (secondary), kWh/month								
= {[(98)m x (201)] } x 100 ÷ (208)								
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
		Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	"	0	(215)
Water heating								_
Output from water heater (calculated above)	105 70 1 400 6	22 442.02	140.00	400.00	400.04	104.44		
185.8 163.83 172.23 154.62 151.69 1 Efficiency of water heater	135.78 130.6	143.03	142.68	160.32	169.24	181.41	70.0	(216)
	79.8 79.8	79.8	79.8	85.09	86.59	87.28	79.8	(217)
Fuel for water heating, kWh/month	79.0	79.0	7 9.0	03.03	00.59	07.20		(217)
(219) m = (64) m x $100 \div (217)$ m								
(219)m= 213.12 188.39 199.27 181.66 183.39 1	170.15 163.		178.8	188.42	195.45	207.85		_
		Tota	ıl = Sum(2	19a) ₁₁₂ =			2249.44	(219)
Annual totals				k\	Wh/year	r I	kWh/year	¬
Space heating fuel used, main system 1							2555.24	_
Water heating fuel used							2249.44	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boi <mark>ler with a fan-assisted flue</mark>						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							304.21	(232)
Total delivered energy for all uses (211)(221) +	(231) + (23	2)(237b)	=				5183.89	(338)
12a. CO2 emissions – Individual heating system	ns including	micro-CHF		_				
	Energy			Emice	ion fac	tor	Emissions	
	kWh/ye	ar		kg CO		toi	kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	551.93	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	485.88	(264)
Space and water heating	(261) + (26	52) + (263) +	(264) =				1037.81	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	157.88	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1234.62	(272)
						ı		_

TER =

(273)

18.62

Property Details: Sample 8 (Top)

Address:

Located in: England

Region: South East England

UPRN:

Date of assessment: 26 July 2019
Date of certificate: 15 June 2022

Assessment type: New dwelling design stage

Transaction type: None of the above

Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium

Water use <= 125 litres/person/day: True

PCDF Version: 498

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2022

Floor Location: Floor area:

70 11-

Living area: 26 m² (fraction 0.371)
Front of dwelling faces: Unspecified

Opening types:

Nan	ne:	Source:	Type:	Glazing:	Argon:	Frame:
DOO	R	Manufacturer	Solid			Wood
W		Manufacturer	Windows	low-E, $En = 0.05$,	soft coat No	
N		Manufacturer	Windows	low-E, En = 0.05 ,	soft coat No	
Balco	ony	Manufactur <mark>er</mark>	Windows	low-E, $En = 0.05$,	soft coat No	

Name:	Gap:	Frame Factor: g-value:		U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
W		0.7	0.4	1	2.72	1
N		0.7	0.4	1	4.16	1
Balcony		0.7	0.4	1	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		INT	Worst case	0	0
W		W	West	0	0
N		N	North	0	0
Balcony		N	North	0	0

Overshading: More than average

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Element	<u>:S</u>						
N	29.4	8.96	20.44	0.15	0	False	N/A
W	29.4	2.72	26.68	0.15	0	False	N/A
INT	14.1	2.4	11.7	0.16	0.43	False	N/A
Spandrel	2.4	0	2.4	0.35	0	False	N/A
E	17.1	0	17.1	0.15	0	False	N/A
Roof	70	0	70	0.11	0		N/A
Internal Element	<u>s</u>						

Party Elements

Thermal bridges:								
Thermal bridges:	No information on thermal bridging (y=0.15) (y =0.15)							
Ventilation:								
Pressure test:	Yes (As designed)							
Ventilation:	Balanced with heat recovery							
	Number of wet rooms: Kitchen + 1							
	Ductwork: Insulation, rigid							
	Approved Installation Scheme: True							
Number of chimneys:	0							
Number of open flues:	0							
Number of fans:	0							
Number of passive stacks:	0 2							
Number of sides sheltered: Pressure test:	3							
Main heating system:								
Main heating system:	Community heating schemes							
	Heat source: Community heat pump							
	heat from electric heat pump, heat fraction 1, efficiency 256							
	Piping>=1991, pre-insulated, low temp, variable flow							
	Central heating pump: 2013 or later Design flow temperature: Design flow temperature >45°C							
	Boiler interlock: Yes							
Main heating Control:	Botter interrock. Tes							
Main heating Control:	Charging system linked to use of community heating, programmer and TRVs							
man, noaming control	Control code: 2306							
Secondary heating system:								
Secondary heating system:	None							
Water heating:								
Water heating:	From main heating system							
Water Heating.	Water code: 901							
	Fuel :mains gas							
	No hot water cylinder							
	Flue Gas Heat Recovery System:							
	Database (rev 498, product index 060036)							
	Brand name: Worcester							
	Model: Greenstar Xtra							
	Model qualifier: 2015							
Others:	Solar panel: False							
Electricity tariff:	Standard Tariff							
In Smoke Control Area:	Yes							
Conservatory:	No conservatory 100%							
Low energy lights:	Dense urban							
Terrain type: EPC language:	English							
Wind turbine:	No							
Photovoltaics:	Photovoltaic 1							
. Hotovoltalos.	Installed Peak power: 0.6							
	Tilt of collector: 30°							
	Overshading: None or very little							
	Collector Orientation: South							

Collector Orientation: South

No

Assess Zero Carbon Home:

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	SAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
			Р	roperty .	Address	Sample	e 8 (Top))			
Address:	-1										
1. Overall dwelling dimer	isions:			Aro	n/m²\		Av. Ho	ight(m)		Volume(m	3)
Ground floor				Ale	70	(1a) x		3	(2a) =	210	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+	(1d)+(1e)+(1r	n)	70	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	d)+(3e)+	.(3n) =	210	(5)
2. Ventilation rate:											
Number of chimneys	main heating		econdar eating	у П + Г	other 0	7 = [total	x	40 =	m³ per hou	ır
Number of open flues	0	╡╻╞	0	┧╻┝	0]	0	x	20 =	0	(6b)
Number of intermittent fan			0	J L	U	J L			10 =		╡`´
	3					Ļ	0		10 =	0	(7a)
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas fire	es					L	0	X 4	40 =	0	(7c)
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimney	s, flues and f	ans = (6	a)+(6b)+(7	'a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be	en ca <mark>rried o</mark> ut o	r is intende	ed, procee	d to (17), o	otherwise o	continue fr	om (9) to (
Number of storeys in the	e dw <mark>elling</mark> (n	s)								0	(9)
Additional infiltration)5 for atom 1 -			0.05 (**)				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre						•	uction			0	(11)
deducting areas of opening			portuning to	. u.o g.out	o. man aro	a (artor					
If suspended wooden flo		,	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente										0	(13)
Percentage of windows	and doors di	aught st	ripped		0.25 - [0.2	v (1.4) · . 1	001			0	(14)
Window infiltration Infiltration rate					•	` '	00] = [2] + (13) -	ı (15) —		0	(15)
Air permeability value, o	150 AVNTASS	ad in cub	ic metre	e nar ho					area	0	(16)
If based on air permeabilit						•	elle oi e	ilvelope	aica	0.15	(18)
Air permeability value applies	•						is being us	sed		0.13	(10)
Number of sides sheltered	1									2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	ctor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified fo	r monthly wir	nd speed	l							1	
Jan Feb M	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Tab	le 7	-	•						1	
(22)m= 5.1 5	1.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4										
	.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

0.16	0.16 0.16	0.14	0.14 0.12	0.12	0.12	(22a)m _{0.13}	0.14	0.14	0.15		
Calculate effec	ctive air change	1 1		1 -	0.12	0.13	0.14	0.14	0.15		
If mechanica	_									0.5	(2:
If exhaust air he	eat pump using App	oendix N, (23b)	= (23a) × Fmv (equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2:
If balanced with	heat recovery: effi	ciency in % allo	owing for in-use	factor (fron	n Table 4h) =				79.05	(2:
a) If balance	d mechanical v	entilation wi	th heat recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [′	1 – (23c)	÷ 100]	
24a)m= 0.27	0.26 0.26	0.25	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
b) If balance	d mechanical v	entilation wi	thout heat re	covery (I	MV) (24b)m = (22	2b)m + (2	23b)		•	
24b)m= 0	0 0	0	0 0	0	0	0	0	0	0		(24
,	ouse extract ve $1 < 0.5 \times (23b)$,	•	•				5 × (23b)			
24c)m= 0	0 0	0	0 0	0	0	0	0	0	0		(2
,	ventilation or wl n = 1, then (24d		•				0.5]				
24d)m= 0	0 0	0	0 0	0	0	0	0	0	0		(2
Effective air	change rate - e	nter (24a) o	r (24b) or (24	c) or (24	d) in box	(25)					
25)m= 0.27	0.26 0.26	0.25	0.24 0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
3. Heat losses	s and heat loss	parameter:					•		_		
LEMENT	Gross area (m²)	Openings m ²	Net Ai A ,i		U-valı W/m2		A X U (W/k	()	k-value kJ/m²-ł		A X k kJ/K
)oo <mark>rs</mark>			2.4	x	1.4	= [3.36				(2
Vin <mark>dows</mark> Type	:1		2.72	. x	1/[1/(1)+	0.04] =	2.62				(2
Vindows Type	2		4.16	x	1/[1/(1)+	0.04] =	4				(2
Vindows Type	3		4.8	x	1/[1/(1)+	0.04] =	4.62				(2
Valls Type1	29.4	8.96	20.4	4 x	0.15	=	3.07	\exists			(2
Valls Type2	29.4	2.72	26.6	8 X	0.15	=	4				(2
								= =			
Valls Type3	14.1	2.4	11.7	, x	0.15	=	1.75				(2
• •	2.4		11.7	x x	0.15	= [1.75 0.84	_			==
Valls Type4		2.4	╡ ├──	X		=		_			(2
Valls Type3 Valls Type4 Valls Type5 Roof	2.4	0	2.4	X	0.35	=	0.84				(2
Valls Type4 Valls Type5	2.4 17.1 70	0 0	2.4	x x x	0.35	= [0.84 2.57				(2
Valls Type4 Valls Type5 Coof Otal area of el	2.4 17.1 70	2.4 0 0 0 effective windo	2.4 17.1 70 162. w U-value calcu	x x x x	0.35 0.15 0.11	= [= [= [0.84 2.57 7.7	s given in	paragraph	3.2	(2)
Valls Type4 Valls Type5 Coof Otal area of elfor windows and include the area	2.4 17.1 70 lements, m² roof windows, use	2.4 0 0 0 effective windo internal walls ar	2.4 17.1 70 162. w U-value calcu	x x x x	0.35 0.15 0.11	= [= [= [/[(1/U-valu	0.84 2.57 7.7	s given in	paragraph	34.52	(2 (2 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
Valls Type4 Valls Type5 Roof Total area of elfor windows and the area fabric heat los	2.4 17.1 70 Ilements, m² roof windows, use as on both sides of a	2.4 0 0 0 effective windo internal walls ar	2.4 17.1 70 162. w U-value calcu	x x x x	0.35 0.15 0.11	= [= [- [(1/U-value)]] + (32) =	0.84 2.57 7.7				(2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Valls Type4 Valls Type5 Roof Total area of elfor windows and * include the area Tabric heat los Heat capacity (2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A)	2.4 0 0 0 effective windo internal walls all x U)	2.4 17.1 70 162. w U-value calculated partitions	x x x 4	0.35 0.15 0.11	= [= [- = [0.84 2.57 7.7 (e)+0.04] as) + (32a).		34.52	(3)
Valls Type4 Valls Type5 Coof Cotal area of elector windows and a include the area abric heat los leat capacity (hermal mass or design assess	2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x Cm = S(A x k))	2.4 0 0 offective windo internal walls and U) IP = Cm ÷ TI details of the cortillation.	2.4 17.1 70 162.w U-value calcund partitions	x x x 4	0.35 0.15 0.11 0.11 0.11 0.11	= [= [- = [0.84 2.57 7.7 (e)+0.04] a (30) + (32)) + (32a). Medium	(32e) =	34.52 1726.48	(3)
Valls Type4 Valls Type5 Roof Total area of elfor windows and and an area include the area fabric heat los leat capacity (Thermal mass for design assess an be used instead	2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x k) parameter (TM) sments where the deserted as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the second as a constant with the sec	2.4 0 0 offective windo internal walls all X U) IP = Cm ÷ TI letails of the conficulation.	2.4 17.1 70 162. w U-value calcund partitions FA) in kJ/m²k	x x x 4 lated using	0.35 0.15 0.11 0.11 0.11 0.11	= [= [- = [0.84 2.57 7.7 (e)+0.04] a (30) + (32)) + (32a). Medium	(32e) =	34.52 1726.48	(2)

Ventila	tion hea	it loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.52	18.3	18.08	16.98	16.76	15.65	15.65	15.43	16.09	16.76	17.2	17.64		(38)
Heat tra	ansfer c	oefficier	nt, W/K	-				-	(39)m	= (37) + (37)	38)m			
(39)m=	77.4	77.18	76.96	75.85	75.63	74.53	74.53	74.31	74.97	75.63	76.07	76.52		
Heat lo	ss para	meter (F	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	75.8	(39)
(40)m=	1.11	1.1	1.1	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.09	1.09		
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.08	(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)
Assum	ed occu A > 13.9	pancy, l 9, N = 1			(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (1	ΓFA -13.		kWh/ye	ear:	(42)
Annual		e hot wa						(25 x N) to achieve		e target o		7.55		(43)
			person per			_	•	o acmeve	a water us	e larger o	'			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						ООР		1101			
(44)m=	96.3	92.8	89.3	85.79	82.29	78.79	78.79	82.29	85.79	89.3	92.8	96.3		
Energy c	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1050.55	(44)
(45)m=	142.81	124.9	128.89	112.37	107.82	93.04	86.22	98.93	100.12	116.67	127.36	138.3		
If instant	aneous w	ater heatii	na at noint	of use (no	hot water	storage)	enter () in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1377.43	(45)
г			· ,	,				` ′	. ,	17.5	10.1	20.75		(46)
(46)m= Water s	21.42 storage	18.74 loss:	19.33	16.86	16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.75	ı	(40)
	_		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Otherw	•	stored	nd no ta hot wate		•			(47) ombi boil	ers) ente	er 'O' in (47)			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage eclared o			or io not		(48) x (49)	=		1	10		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl							0.	.02		(51)
	-	eaung s from Tal	ee section ble 2a	011 4.3							1	.03		(52)
			m Table	2b								0.6		(53)
•			storage		ear			(47) x (51)	x (52) x (53) =		.03		(54)
□Heruv			_	, ,					. , (•			1	(55)
• • • • • • • • • • • • • • • • • • • •	(50) or (54) in (5	5)								1.	.03	l	(33)
Enter (, ,	o5) culated f	for each	month			((56)m = (55) × (41)r	m	1.	.03		(55)

If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	: loss (ar	nual) fro	m Table	3	•	•					0		(58)
Primary circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				'	
(modified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	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) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat req	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 198.09	174.83	184.17	165.86	163.1	146.53	141.49	154.21	153.61	171.95	180.85	193.58		(62)
Solar DHW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	I lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (G)				<u>-</u>	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 18.35	16.34	16.79	14.86	14.3	12.43	11.52	13.19	13.34	15.37	16.62	17.85		(63) (G2)
Output from w	ater hea	ter											
(64)m= 177.06	156.07	164.69	148.41	146.11	131.51	127.29	138.34	137.67	153.9	161.64	173.05		_
							Outp	out from wa	ater heate	r (annual)₁	12	1815.73	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2		× (45)m	+ (61)n	1] + 0.8 >	۲ [(4 <mark>6)m</mark>	+ (57)m	+ (59)m	1	
(65)m= 91.71	81.47	87.08	80.16	80.07	73.73	72.89	77.12	76.08	83.02	85.14	90.21		(65)
												1	
in <mark>clude</mark> (57)	m in calc	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	<mark>mu</mark> nity h	eating	
include (57) 5. Internal ga			` ′		ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	neating	
	ains (see	Table 5	and 5a		ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Internal ga	ains (see	Table 5	and 5a		ylinder is Jun	s in the o	dwelling Aug	Sep	ater is fr	om com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):								neating	(66)
5. Internal ga Metabolic gair Jan	real section (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (section) (se	Table 5 5), Wat Mar 112.31 ted in Ap	ts Apr 112.31	May 112.31	Jun 112.31	Jul 112.31	Aug 112.31	Sep 112.31	Oct 112.31	Nov	Dec 112.31	neating	(66)
5. Internal ga Metabolic gair Jan (66)m= 112.31	res (Table Feb 112.31	Table 5 5), Wat Mar 112.31	and 5a) ts Apr 112.31	May 112.31	Jun 112.31	Jul 112.31	Aug 112.31	Sep 112.31	Oct	Nov	Dec	neating	(66) (67)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga	res (Table Feb 112.31 (calcula 16.61 ins (calcula	Table 5 5), Wat Mar 112.31 ted in Ap 13.51	Apr 112.31 ppendix 10.23	May 112.31 L, equat 7.64 dix L, eq	Jun 112.31 ion L9 o 6.45 uation L	Jul 112.31 r L9a), a 6.97 13 or L1	Aug 112.31 Iso see 9.06 3a), also	Sep 112.31 Table 5 12.17 see Ta	Oct 112.31	Nov 112.31	Dec 112.31	neating	(67)
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains (67)m= 18.7	reins (see ns (Table Feb 112.31 (calcula 16.61	Table 5 5), Wat Mar 112.31 ted in Ap	ts Apr 112.31 Appendix 10.23	May 112.31 L, equat	Jun 112.31 ion L9 o	Jul 112.31 r L9a), a 6.97	Aug 112.31 Iso see	Sep 112.31 Table 5	Oct 112.31	Nov 112.31	Dec 112.31	neating	, ,
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances games (68)m= 197.3 Cooking gains	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34	Mar 112.31 ted in Ap 13.51 ulated in 194.19	Apr 112.31 ppendix 10.23 Appendix 183.2	May 112.31 L, equat 7.64 dix L, eq	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a	Aug 112.31 Iso see 9.06 3a), also	Sep 112.31 Table 5 12.17 see Ta 150.71	Oct 112.31 15.45 ble 5 161.7	Nov 112.31	Dec 112.31	neating	(67) (68)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34	Table 5 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19	Apr 112.31 ppendix 10.23 Appendix 183.2	May 112.31 L, equat 7.64 dix L, eq	Jun 112.31 ion L9 o 6.45 uation L 156.31	Jul 112.31 r L9a), a 6.97 13 or L1 147.6	Aug 112.31 Iso see 9.06 3a), also	Sep 112.31 Table 5 12.17 see Ta 150.71	Oct 112.31 15.45 ble 5 161.7	Nov 112.31	Dec 112.31	neating	(67)
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances games (68)m= 197.3 Cooking gains	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in A	Apr 112.31 ppendix 10.23 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a	Aug 112.31 Iso see 9.06 3a), also 145.55	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table	Oct 112.31 15.45 ble 5 161.7	Nov 112.31 18.03	Dec 112.31 19.22 188.59	neating	(67) (68)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in A	Apr 112.31 ppendix 10.23 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a	Aug 112.31 Iso see 9.06 3a), also 145.55	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table	Oct 112.31 15.45 ble 5 161.7	Nov 112.31 18.03	Dec 112.31 19.22 188.59	neating	(67) (68)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and fair	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23 ins gains 0	112.31 ted in Ap 13.51 ulated in 194.19 ated in A 34.23 (Table 5	112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 see Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0	res (Table Feb 112.31 (calcula 16.61 ins (calcula 199.34 (calcula 34.23 ins gains 0	112.31 ted in Ap 13.51 ulated in 194.19 ated in A 34.23 (Table 5	112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 see Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0 Losses e.g. ev	raporatio	Table 5 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ted in Ap 34.23 (Table 5 0 on (negating)	Apr 112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a) 0	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56 34.23	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69) (70)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and fai (70)m= 0 Losses e.g. ev (71)m= -89.84	raporatio	Table 5 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ted in Ap 34.23 (Table 5 0 on (negating)	Apr 112.31 ppendix 10.23 Appendix 183.2 ppendix 34.23 5a) 0	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23	Oct 112.31 15.45 ble 5 161.7 5 34.23	Nov 112.31 18.03 175.56 34.23	Dec 112.31 19.22 188.59 34.23	neating	(67) (68) (69) (70)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -89.84 Water heating	res (Table Feb 112.31 (calcular 16.61 ins (calcular 34.23 ins gains 0 vaporation -89.84 gains (Table 121.24	Table 5 9 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in Ap 34.23 (Table 5 0 on (negation of the context) -89.84 Table 5)	Apr 112.31 opendix 10.23 n Append 183.2 opendix 34.23 5a) 0 tive valu	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23 0 es) (Tab	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23 0 ole 5) -89.84	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55), also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23 0	Oct 112.31 15.45 ble 5 161.7 5 34.23 0 -89.84	Nov 112.31 18.03 175.56 34.23 0	Dec 112.31 19.22 188.59 34.23 0	neating	(67) (68) (69) (70) (71)
Metabolic gair Jan (66)m= 112.31 Lighting gains (67)m= 18.7 Appliances ga (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -89.84 Water heating (72)m= 123.26	res (Table Feb 112.31 (calcular 16.61 ins (calcular 34.23 ins gains 0 vaporation -89.84 gains (Table 121.24	Table 5 9 5), Wat Mar 112.31 ted in Ap 13.51 ulated in 194.19 ated in Ap 34.23 (Table 5 0 on (negation of the context) -89.84 Table 5)	Apr 112.31 opendix 10.23 n Append 183.2 opendix 34.23 5a) 0 tive valu	May 112.31 L, equat 7.64 dix L, eq 169.34 L, equat 34.23 0 es) (Tab	Jun 112.31 ion L9 of 6.45 uation L 156.31 tion L15 34.23 0 ole 5) -89.84	Jul 112.31 r L9a), a 6.97 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 9.06 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 12.17 See Ta 150.71 ee Table 34.23 0	Oct 112.31 15.45 ble 5 161.7 5 34.23 0 -89.84	Nov 112.31 18.03 175.56 34.23 0	Dec 112.31 19.22 188.59 34.23 0	neating	(67) (68) (69) (70) (71)

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

Orienta		Access Facto Table 6d	or	Area m²		Flu Ta	x ble 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	×	4.16	,	1	0.63	x	0.4	x	0.7	=	8.58	(74)
North	0.9x	0.77	×	4.8	= ,		0.63	x	0.4	x	0.7	<u> </u>	9.9	(74)
North	0.9x	0.77	X	4.16	<u> </u>		20.32	x	0.4	x	0.7	_ =	16.4	(74)
North	0.9x	0.77	x	4.8	= ,	: 2	20.32	x	0.4	x	0.7	<u> </u>	18.93	(74)
North	0.9x	0.77	×	4.16	<u> </u>		34.53	x	0.4	x	0.7	_ =	27.87	(74)
North	0.9x	0.77	X	4.8	<u> </u>	: [;	34.53	x	0.4	x	0.7	=	32.16	(74)
North	0.9x	0.77	x	4.16	<u> </u>		55.46	x	0.4	X	0.7	=	44.77	(74)
North	0.9x	0.77	X	4.8	<u> </u>		55.46	x	0.4	X	0.7	=	51.66	(74)
North	0.9x	0.77	X	4.16	<u> </u>	: -	4.72	x	0.4	x	0.7	=	60.31	(74)
North	0.9x	0.77	X	4.8	,	7	4.72	х	0.4	X	0.7	=	69.59	(74)
North	0.9x	0.77	X	4.16	<u> </u>	7	'9.99	x	0.4	x	0.7	=	64.56	(74)
North	0.9x	0.77	X	4.8	<u> </u>	: -	'9.99	x	0.4	x	0.7	=	74.5	(74)
North	0.9x	0.77	x	4.16	,	- 7	4.68	x	0.4	X	0.7	=	60.28	(74)
North	0.9x	0.77	X	4.8	<u> </u>	- -	4.68	x	0.4	X	0.7	=	69.55	(74)
North	0.9x	0.77	x	4.16	<u> </u>		9.25	x	0.4	X	0.7	=	47.82	(74)
North	0.9x	0.77	X	4.8			9.25	Х	0.4	X	0.7		55.18	(74)
North	0.9x	0.77	x	4.16	<u> </u>		1.52	х	0.4	x	0.7		33.51	(74)
North	0.9x	0.77	x	4.8		. 4	1.52] x	0.4	x	0.7	=	38.67	(74)
North	0.9x	0.77	x	4.16	,	2	24.19	x	0.4	x	0.7	=	19.53	(74)
North	0.9x	0.77	x	4.8	,	2	24.19	Х	0.4	Х	0.7	=	22.53	(74)
North	0.9x	0.77	x	4.16	7		3.12	х	0.4	x	0.7	=	10.59	(74)
North	0.9x	0.77	x	4.8	,		3.12	х	0.4	x	0.7	=	12.22	(74)
North	0.9x	0.77	x	4.16			8.86	x	0.4	х	0.7	=	7.16	(74)
North	0.9x	0.77	X	4.8)		8.86	x	0.4	x	0.7	=	8.26	(74)
West	0.9x	0.77	X	2.72)		9.64	X	0.4	X	0.7	=	10.37	(80)
West	0.9x	0.77	X	2.72)	: [3	88.42	x	0.4	X	0.7	=	20.28	(80)
West	0.9x	0.77	X	2.72	,	. (3.27	x	0.4	x	0.7	=	33.39	(80)
West	0.9x	0.77	X	2.72)		2.28	x	0.4	X	0.7	=	48.7	(80)
West	0.9x	0.77	X	2.72	,	1	13.09	x	0.4	X	0.7	=	59.69	(80)
West	0.9x	0.77	X	2.72)	1	15.77	x	0.4	X	0.7	=	61.1	(80)
West	0.9x	0.77	X	2.72	,	1	10.22	X	0.4	X	0.7	=	58.17	(80)
West	0.9x	0.77	X	2.72	,		94.68	x	0.4	X	0.7	=	49.97	(80)
West	0.9x	0.77	X	2.72)	7	'3.59	x	0.4	X	0.7	=	38.84	(80)
West	0.9x	0.77	X	2.72)	. 4	5.59	x	0.4	X	0.7	=	24.06	(80)
West	0.9x	0.77	X	2.72)	2	24.49	x	0.4	x	0.7	=	12.93	(80)
West	0.9x	0.77	X	2.72)		6.15	x	0.4	x	0.7	=	8.52	(80)
ו		watts, calcul	$\overline{}$		$\overline{}$		1		n = Sum(74)m.				7	
(83)m=	28.85		.43		9.59	200.16	188	152	.97 111.02	66.12	35.73	23.94]	(83)
Ī		internal and		<u>` </u>	_	• •	r	1.55	04 405 55	444.5	104.55	400.55	1	(0.4)
(84)m=	424.8	449.49 474	1.85	506.58 530	0.89	522.02	497.24	467	.94 436.26	411.53	3 404.27	409.69	J	(84)

7. Me	an inter	nal temp	erature	(heating	season)								
				`			from Tah	ole 9, Th	1 (°C)				21	(85)
-		_		living are		_		510 0, 111	. (0)					
Otilise	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.98	0.93	0.8	0.63	0.69	0.9	0.98	1	1		(86)
										0.50	'	'		(00)
								in Table			1		1	(0-)
(87)m=	19.83	19.92	20.13	20.43	20.72	20.92	20.98	20.97	20.83	20.48	20.11	19.81	I	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, Ti	h2 (°C)					
(88)m=	20	20	20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01		(88)
Utilisa	tion fac	tor for a	ains for	rest of d	wellina. I	h2.m (se	e Table	9a)	-	-	-	-		
(89)m=	1	1	0.99	0.97	0.9	0.72	0.51	0.56	0.85	0.98	0.99	1		(89)
Moon	intorna	Ltompor	oturo in	the rest	of dwolli	na T2 /f	ollow etc	eps 3 to 7	7 in Tahl	0.00)	<u>I</u>			
(90)m=	18.43	18.58	18.87	19.32	19.72	19.97	20.02	20.02	19.88	19.4	18.86	18.42		(90)
(50)111=	10.40	10.00	10.07	10.02	10.72	10.07	20.02	20.02		LA = Livin	<u> </u>		0.37	(91)
											garoar(.,	0.57	(01)
Mean			· ·					+ (1 – fL			1		1	
(92)m=	18.95	19.08	19.34	19.73	20.09	20.32	20.38	20.37	20.23	19.8	19.32	18.93		(92)
								4e, whe	re appro					
(93)m=	18.95	19.08	19.34	19.73	20.09	20.32	20.38	20.37	20.23	19.8	19.32	18.93		(93)
		ting requ								_		_		
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut				using Ta		Luca	lui -	A	0.00	0-1	Nison	Data		
Litilion	Jan	Feb tor for a	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	1	tor for g	0.99	0.97	0.91	0.75	0.55	0.61	0.86	0.97	0.99	1		(94)
(94)m=						0.75	0.55	0.61	0.00	0.97	0.99	ı	ı	(34)
(95)m=	423.17	446.89	469.38	490.63	480.76	389.94	275.64	285.54	376.52	400.66	401.39	408.38		(95)
							273.04	203.34	370.32	400.00	401.39	400.30	i	(33)
(96)m=	4.3	4.9	6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
											7.1	4.2	i	(30)
(97)m=	1133.7	1094.16	988.1	821.43	634.54	426.61	281.65	x [(93)m- 295.3	459.75	695.89	929.91	1127.45		(97)
							<u> </u>	24 x [(97)			<u> </u>	1127.43		(01)
(98)m=	528.64	434.97	385.93	238.18	114.42	0	0.02	0	0	219.65	380.53	534.99		
(50)111=	020.04	404.07	000.00	200.10	114.42	Ŭ							2837.3	(98)
_								Tota	l per year	(KVVII/yeai) = Sum(9	O)15,912 =		=
Space	e heating	g require	ement in	kWh/m²	/year								40.53	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme	:							
				• .		-		ting prov	-		unity sch	neme.		_
Fractio	n of spa	ce heat	from se	condary,	supplen/	nentary l	neating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ce heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	munity so	heme ma	y obtain he	eat from se	everal sour	ces. The p	orocedure	allows for	CHP and เ	up to four (other heat	sources; ti	he latter	_
includes	boilers, h	eat pumps	s, geotherr	mal and wa	aste heat f			See Appei						_
Fractio	n of hea	at from C	Commun	ity heat _l	oump								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	y heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating		kWh/year	_
Annual space heating requirement		2837.3	_
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2979.17	(307a)
Efficiency of secondary/supplementary heating system in % (from 7	Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1815.73	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1906.52	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] = 48.86	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	rside	124.9	(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) =	124.9	(331)
Energy for lighting (calculated in Appendix L)		330.25	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.17	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + ((315) + (331) + (332)(237b) =	4822.66	(338)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission fac kWh/year kg CO2/kWh	tor 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	o fuels repeat (363) to (366) for the secon	256	(367a)
CO2 associated with heat source 1 [(307b)+(310	0b)] x 100 ÷ (367b) x 0.52	= 990.5	(367)
Electrical energy for heat distribution [(31)	3) x 0.52	= 25.36	(372)
Total CO2 associated with community systems (363	3)(366) + (368)(372)	= 1015.85	(373)
CO2 associated with space heating (secondary) (309	9) x 0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous	s heater (312) x 0.22	= 0	(375)
Total CO2 associated with space and water heating (373	3) + (374) + (375) =	1015.85	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x 0.52	= 64.82	(378)
CO2 associated with electricity for lighting (332	2))) x 0.52	= 171.4	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1	0.52 × 0.0	1 = -268.93	(380)

Total CO2, kg/year Dwelling CO2 Emission Rate El rating (section 14) sum of (376)...(382) =

 $(383) \div (4) =$

983.14 (383) 14.04 (384) 88.54 (385)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	;	Stroma Softwa	re Ve	rsion:	\	Versio	on: 1.0.5.51	
Address :	·	Property A	Address.	Sample	e o (10p))			
1. Overall dwelling dimer	nsions:								
0 1"		Area			Av. He	ight(m)	7	Volume(m	<u> </u>
Ground floor			70	(1a) x		3	(2a) =	210	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1i	n)	70	(4)					
Dwelling volume				(3a)+(3b))+(3c)+(3d	d)+(3e)+	(3n) =	210	(5)
2. Ventilation rate:									
	main secondar heating heating	ry (other		total			m³ per hou	ır
Number of chimneys	0 + 0] + [0] = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fan	ns			·	2	x	10 =	20	(7a)
Number of passive vents					0	х	10 =	0	(7b)
Number of flueless gas fire	es			<u> </u>	0	X ·	40 =	0	(7c)
		70) ((7b) ((7						nanges per ho	our
	s, flues and fans = (6a)+(6b)+(7 en carried out or is intended, procee			ontinue fr	20 com (9) to (÷ (5) =	0.1	(8)
Number of storeys in the					(2) 22 (, ,		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame of			•	uction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding to gs): if equal user 0.35	o the greate	er wall area	a (after					
If suspended wooden flo	oor, enter 0.2 (unsealed) or 0	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0							0	(13)
-	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	,	-	(45)		0	(15)
Infiltration rate					12) + (13) -			0	(16)
•	q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre q50, expressed in cubic metre	-	•	•	etre of e	envelope	area	5	(17)
·	if a pressurisation test has been do				is being us	sed		0.35	(18)
Number of sides sheltered		J	,	,	J			2	(19)
01 14 6 4		((20) = 1 - [0.075 x (1	19)] =			0.85	(20)
Shelter factor									
Shelter factor Infiltration rate incorporation	ng shelter factor	((21) = (18)	x (20) =				0.29	(21)
Infiltration rate incorporation	r monthly wind speed				.	1	1	0.29	(21)
Infiltration rate incorporation rate modified fo	-	Jul	(21) = (18) Aug	x (20) =	Oct	Nov	Dec	0.29	(21)
Infiltration rate incorporation Infiltration rate modified fo Jan Feb Monthly average wind spe	Mar Apr May Juneed from Table 7	Jul	Aug	Sep		1		0.29	(21)
Infiltration rate incorporation Infiltration rate modified fo Jan Feb Monthly average wind spe	or monthly wind speed Mar Apr May Jun				Oct 4.3	Nov 4.5	Dec 4.7	0.29	(21)
Infiltration rate incorporation Infiltration rate modified fo Jan Feb Monthly average wind spe	Mar Apr May Jun eed from Table 7 4.9 4.4 4.3 3.8	Jul	Aug	Sep		1		0.29	(21)

0.37	0.37 0.36	0.32	0.32	0.28	0.28	0.27	(22a)m _{0.29}	0.32	0.33	0.34	1	
Calculate effec	ctive air change	1		1 ' '	I	J	0.20	0.02	0.00	1 0.0 .	J	
If mechanica	al ventilation:										0	(2
	eat pump using App) = (23a)			0	(2
If balanced with	heat recovery: eff	iciency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	d mechanical v	entilation/	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
!4a)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(2
· —	d mechanical v	entilation		1	covery (N	MV) (24b	i `		 		7	
4b)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(2
,	ouse extract ven $< 0.5 \times (23b)$,		•	•				5 × (23b	o)		_	
4c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(2
,	ventilation or w n = 1, then (24c			•				0.5]				
4d)m= 0.57	0.57 0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56]	(2
Effective air	change rate - e	enter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
5)m= 0.57	0.57 0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		()
B. Heat losse	s and heat loss	paramete	er:							_	_	
LEMENT	Gross area (m²)	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
oors				2.4	х	1	= [2.4				(
/in <mark>dows</mark> Type	: 1			2.72	x1	/[1/(1.4)+	0.04] =	3.61	П			(:
/indows Type	2											
lin dans True				4.16		/[1/(1.4)+	1	5.52	Ę			· ·
• •			_	4.16		/[1/(1.4)+ /[1/(1.4)+	1	5.52 6.36			_ 	(
/alls Type1	29.4	8.96	=	4.8	x1	/[1/(1.4)+ 0.18	1	6.36				()
/alls Type1 /alls Type2	3	8.96	=	4.8	x1	/[1/(1.4)+	0.04] =	6.36				()
/indows Type /alls Type1 /alls Type2 /alls Type3	29.4		=	4.8	x1 4 x 3 x	/[1/(1.4)+ 0.18	0.04] =	6.36				(:
/alls Type1 /alls Type2 /alls Type3 /alls Type4	29.4	2.72	=	20.44 26.68	x1 4 x 3 x	/[1/(1.4)+ 0.18 0.18	0.04] = [6.36 3.68 4.8				
/alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5	29.4 29.4 14.1	2.72	=	20.44 26.68 11.7	x1 4	0.18 0.18 0.18	0.04] = [6.36 3.68 4.8 2.11				
/alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof	29.4 29.4 14.1 2.4 17.1	2.72	=	4.8 20.44 26.68 11.7 2.4	x1 4	0.18 0.18 0.18 0.18	0.04] = [6.36 3.68 4.8 2.11 0.43				
/alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof otal area of e	29.4 29.4 14.1 2.4 17.1 70 Ilements, m ²	2.72 2.4 0 0		4.8 20.44 26.68 11.7 2.4 17.1 70	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = =	6.36 3.68 4.8 2.11 0.43 3.08 9.1				(3)
Valls Type1 Valls Type2 Valls Type3 Valls Type4 Valls Type5 Coof Cotal area of e	29.4 29.4 14.1 2.4 17.1 70 Ilements, m ²	2.72 2.4 0 0 0 effective wi	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = =	6.36 3.68 4.8 2.11 0.43 3.08 9.1	as given in	paragrapl	h 3.2	
alls Type1 alls Type2 alls Type3 alls Type4 alls Type5 oof otal area of e or windows and include the area	29.4 29.4 14.1 2.4 17.1 70 Ilements, m ²	2.72 2.4 0 0 0 effective wii	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = [6.36 3.68 4.8 2.11 0.43 3.08 9.1] [paragrapl	h 3.2	
alls Type1 alls Type2 alls Type3 alls Type4 alls Type5 oof otal area of e or windows and include the area abric heat los	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of	2.72 2.4 0 0 0 effective wii	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul	x1 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = = /[(1/U-value) + (32) =	6.36 3.68 4.8 2.11 0.43 3.08 9.1				
Valls Type1 Valls Type2 Valls Type3 Valls Type4 Valls Type5 Oof Otal area of each of windows and include the area abric heat lose eat capacity (29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of es, W/K = S (A x)	2.72 2.4 0 0 0 v effective wiinternal walk	ndow U-va	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calculatitions	x1 4 x 3 x x x x 4	0.18 0.18 0.18 0.18 0.18 0.18 0.13	0.04] = = = = = = (1/U-value) + (32) =	6.36 3.68 4.8 2.11 0.43 3.08 9.1	2) + (32a).		41.0	() () () () () () () () () () () () () (
falls Type1 falls Type2 falls Type3 falls Type4 falls Type5 foof fotal area of earth of the area fabric heat lose eat capacity for the area for design assess	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x k)	2.72 2.4 0 0 0 effective will internal walk x U) MP = Cm :	ndow U-vals and par	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcultitions	x1 4 x 3 x x x x x 4 x 4 x	0.18 0.18 0.18 0.18 0.18 0.18 0.13 0.13 (26)(30)	0.04] = = = = = = /[(1/U-value) + (32) = ((28)	6.36 3.68 4.8 2.11 0.43 3.08 9.1 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.0 1726	() () () () () () () () () () () () () (
Valls Type1 Valls Type2 Valls Type3 Valls Type4 Valls Type5 Oof Otal area of each of the area abric heat lose eat capacity of the area of the area of the area abric heat lose eat capacity of the area or design assess or design assess or design assess or be used instead	29.4 29.4 14.1 2.4 17.1 70 Ilements, m² roof windows, use as on both sides of as, W/K = S (A x k) parameter (TM sments where the of as the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same transport of the same t	2.72 2.4 0 0 0 effective windering internal walks x U) MP = Cm - details of the local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local local loc	ndow U-vals and par	4.8 20.44 26.68 11.7 2.4 17.1 70 162.4 alue calcul titions	x1 4 x 3 x x x x x 4 lated using	0.18 0.18 0.18 0.18 0.18 0.18 0.13 0.13 (26)(30)	0.04] = = = = = = /[(1/U-value) + (32) = ((28)	6.36 3.68 4.8 2.11 0.43 3.08 9.1 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.0 1726	08 (0

Ventilat	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	39.5	39.31	39.13	38.26	38.1	37.34	37.34	37.2	37.63	38.1	38.43	38.77		(38)
Heat tra	ansfer c	oefficier	nt, W/K	-		-	-		(39)m	= (37) + (38)m	-		
(39)m=	88.7	88.51	88.33	87.46	87.3	86.55	86.55	86.41	86.84	87.3	87.63	87.97		
- Heat lo	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	87.46	(39)
(40)m=	1.27	1.26	1.26	1.25	1.25	1.24	1.24	1.23	1.24	1.25	1.25	1.26		
Numbe	er of day	s in moi	nth (Tab	le 1a)						Average =	Sum(40) ₁ .	12 /12=	1.25	(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. Wat	ter heat	ing ene	rgy requi	irement:								kWh/ye	ar:	
Δeeum	ed occu	ipancy, I	N									25		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		25		(42)
								(25 x N)			87	.55		(43)
				usage by : [·] day (all w				to achieve	a water us	se target o	f			
Г	Jan	Feb	Mar		Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Hot wate				Apr ach month					Sep	Oct	NOV	Dec		
(44)m=	96.3	92.8	89.3	85.79	82.29	78.79	78.79	82.29	85.79	89.3	92.8	96.3		
,		32.0									m(44) ₁₁₂ =		1050.55	(44)
Energy c	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	142.81	124.9	128.89	112.37	107.82	93.04	86.22	98.93	100.12	116.67	127.36	138.3		
If inetants	aneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	_ [1377.43	(45)
г		18.74		16.86		· · ·		, ,	. , ,	47.5	10.1	20.75		(46)
(46)m= [Water s	21.42 storage		19.33	10.00	16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.75		(40)
	_		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
If comn	nunity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage			(- /1.14/1	(d.)							
•				oss facto	or is kno	wn (kvvr	n/day):					39		(48)
•			m Table					(10)				54		(49)
			_	, kWh/ye cylinder l		or is not		(48) x (49)) =		0.	75		(50)
•				om Tabl								0		(51)
			ee secti											
		from Ta										0		(52)
•			m Table									0		(53)
• • • • • • • • • • • • • • • • • • • •			-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
•	` ′ ′	(54) in (5	•	ا سما	ma n := 41:			//E0\===	FF) ///	_	0.	75		(55)
Water s _{(56)m=} [for each			·	((56)m = (
	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56

If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (an	nual) fro	m Table	3		-			-		0		(58)
Primary circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	55 × (41)	m				,	
(modified by							_		—			1	
(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	İ	(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	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 189.41	166.99	175.48	157.46	154.41	138.13	132.81	145.53	145.21	163.27	172.45	184.9		(62)
Solar DHW input of	alculated	using App	endix G or	· Appendix	H (negati	ve quantity	v) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional	lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix ()	ī	ī		1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	j	(63)
FHRS 0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output from wa	ater hea	ter										,	
(64)m= 189.41	166.99	175.48	157.46	154.41	138.13	132.81	145.53	145.21	163.27	172.45	184.9		7
										r (annual)₁		1926.05	(64)
Heat gains from	n water	_	kWh/mo	onth 0.2	5 ^[0.85	× (45)m	+ (61)m] + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	
(65)m= 84.76	75.2	80.13	73.44	73.13	<mark>6</mark> 7.01	65.94	70.17	69.36	76.07	78.42	83.26		(65)
in <mark>clude</mark> (57)r	m in calc	culation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	<mark>mu</mark> nity h	neating	
include (57)r 5. Internal ga			` '		ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
	nins (see	Table 5	and 5a		ylinder is	s in the			ater is fr	om com	<mark>mu</mark> nity h	neating	
5. Internal ga	ins (see s (Table Feb	Table 5 5), Wat Mar	and 5a) ts Apr	: May	Jun	Jul	Aug	Sep	Oct	Nov	munity h	neating	
5. Internal ga	ins (see s (Table	Table 5	and 5a):								neating	(66)
5. Internal games Metabolic gain Jan (66)m= 112.31 Lighting gains	s (Table Feb 112.31 (calcular	Table 5 5), Wat Mar 112.31 ted in Ap	ts Apr 112.31 ppendix	May 112.31	Jun 112.31 ion L9 oi	Jul 112.31	Aug 112.31 Iso see	Sep 112.31	Oct	Nov	Dec	neating	
5. Internal ga Metabolic gain Jan (66)m= 112.31	s (Table Feb 112.31	5), Wat Mar 112.31	and 5a) ts Apr 112.31	May 112.31	Jun 112.31	Jul 112.31	Aug 112.31	Sep 112.31	Oct	Nov	Dec	neating	(66) (67)
5. Internal ga Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai	s (Table Feb 112.31 (calcula 16.17 ns (calc	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in	Apr 112.31 ppendix 9.95	May 112.31 L, equat 7.44 dix L, eq	Jun 112.31 ion L9 or 6.28 uation L	Jul 112.31 r L9a), a 6.79 13 or L1	Aug 112.31 Iso see 8.82 3a), also	Sep 112.31 Table 5 11.84 see Tal	Oct 112.31 15.04 ble 5	Nov 112.31 17.55	Dec 112.31	neating	(67)
5. Internal games Metabolic gains Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3	s (Table Feb 112.31 (calcula 16.17 ns (calc	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19	Apr 112.31 ppendix 9.95 Appendix 183.2	May 112.31 L, equat 7.44 dix L, eq	Jun 112.31 ion L9 or 6.28 uation L	Jul 112.31 r L9a), a 6.79 13 or L1 147.6	Aug 112.31 Iso see - 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Ta 150.71	Oct 112.31 15.04 ble 5 161.7	Nov 112.31	Dec 112.31	neating	
5. Internal ga Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains	s (Table Feb 112.31 (calcula 16.17 ns (calcula 199.34 (calcula	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19	Apr 112.31 opendix 9.95 Append 183.2 opendix	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a	Aug 112.31 Iso see - 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Ta 150.71	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31	neating	(67) (68)
5. Internal games Metabolic gains Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3	s (Table Feb 112.31 (calcula 16.17 ns (calc	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19	Apr 112.31 ppendix 9.95 Appendix 183.2	May 112.31 L, equat 7.44 dix L, eq	Jun 112.31 ion L9 or 6.28 uation L	Jul 112.31 r L9a), a 6.79 13 or L1 147.6	Aug 112.31 Iso see - 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Ta 150.71	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31	neating	(67)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23	Apr 112.31 ppendix 9.95 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a	Aug 112.31 Iso see 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31 18.71 188.59	neating	(67) (68) (69)
Metabolic gains [66]m= 112.31 Lighting gains [67]m= 18.2 Appliances gai [68]m= 197.3 Cooking gains [69]m= 34.23	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23	Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23	Apr 112.31 ppendix 9.95 Append 183.2 ppendix 34.23	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a	Aug 112.31 Iso see 8.82 3a), also 145.55	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table	Oct 112.31 15.04 ble 5 161.7	Nov 112.31 17.55	Dec 112.31 18.71 188.59	neating	(67) (68)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23 ns gains	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see - 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3	s (Table Feb 112.31 (calcula 16.17 ns (calc 199.34 (calcula 34.23 ns gains	Table 5 5), Wat Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a)	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see - 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69)
Metabolic gains Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3 Losses e.g. even	s (Table Feb 112.31 (calcula 16.17 ns (calcula 34.23 ns gains 3 aporatio -89.84	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 on (negative)	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69) (70) (71)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3 Losses e.g. ev. (71)m= -89.84	s (Table Feb 112.31 (calcula 16.17 ns (calcula 34.23 ns gains 3 aporatio -89.84	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 on (negative)	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 or 6.28 uation L 156.31 tion L15 34.23	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23	Oct 112.31 15.04 ble 5 161.7 5 34.23	Nov 112.31 17.55 175.56	Dec 112.31 18.71 188.59 34.23	neating	(67) (68) (69) (70)
Metabolic gain: Jan (66)m= 112.31 Lighting gains (67)m= 18.2 Appliances gai (68)m= 197.3 Cooking gains (69)m= 34.23 Pumps and far (70)m= 3 Losses e.g. ev. (71)m= -89.84 Water heating	s (Table Feb 112.31 (calcular 16.17 ns (calcular 199.34 (calcular 34.23 ns gains 3 aporatio -89.84 gains (Table 111.9	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 In (negation 198.84) Table 5) 107.7	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3 tive valu	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.28 uation L 156.31 tion L15 34.23 3 ole 5) -89.84	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23 3	Oct 112.31 15.04 ble 5 161.7 5 34.23 3 -89.84	Nov 112.31 17.55 175.56 34.23 3	Dec 112.31 18.71 188.59 34.23 3	neating	(67) (68) (69) (70) (71)
Metabolic gains [66]m= 112.31 Lighting gains [67]m= 18.2 Appliances gai [68]m= 197.3 Cooking gains [69]m= 34.23 Pumps and far [70]m= 3 Losses e.g. ev [71]m= -89.84 Water heating [72]m= 113.93	s (Table Feb 112.31 (calcular 16.17 ns (calcular 199.34 (calcular 34.23 ns gains 3 aporatio -89.84 gains (Table 111.9 gains = 387.11	Table 5 Mar 112.31 ted in Ap 13.15 ulated in 194.19 ted in Ap 34.23 (Table 5 3 In (negation 198.84) Table 5) 107.7	Apr 112.31 ppendix 9.95 Appendix 183.2 ppendix 34.23 5a) 3 tive valu	May 112.31 L, equat 7.44 dix L, eq 169.34 L, equat 34.23	Jun 112.31 ion L9 of 6.28 uation L 156.31 tion L15 34.23 3 ole 5) -89.84	Jul 112.31 r L9a), a 6.79 13 or L1 147.6 or L15a) 34.23	Aug 112.31 Iso see 8.82 3a), also 145.55 , also se 34.23	Sep 112.31 Table 5 11.84 see Tal 150.71 ee Table 34.23 3	Oct 112.31 15.04 ble 5 161.7 5 34.23 3 -89.84	Nov 112.31 17.55 175.56 34.23 3	Dec 112.31 18.71 188.59 34.23 3	neating	(67) (68) (69) (70) (71)

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

Orientation:	Access Fac Table 6d	tor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	X	4.16	x	10.63	x	0.63	x	0.7	=	13.52	(74)
North 0.9	x 0.77	x	4.8	X	10.63	x	0.63	x	0.7	=	15.6	(74)
North 0.9	x 0.77	X	4.16	X	20.32	x	0.63	x	0.7	=	25.84	(74)
North 0.9	x 0.77	x	4.8	x	20.32	x	0.63	x	0.7	=	29.81	(74)
North 0.9	x 0.77	X	4.16	X	34.53	X	0.63	x	0.7	=	43.9	(74)
North 0.9	x 0.77	X	4.8	X	34.53	X	0.63	x	0.7	=	50.65	(74)
North 0.9	x 0.77	X	4.16	X	55.46	X	0.63	x	0.7		70.51	(74)
North 0.9	x 0.77	X	4.8	X	55.46	X	0.63	x	0.7	=	81.36	(74)
North 0.9	x 0.77	X	4.16	X	74.72	x	0.63	x	0.7	=	94.99	(74)
North 0.9	x 0.77	x	4.8	X	74.72	x	0.63	x	0.7	=	109.6	(74)
North 0.9	x 0.77	x	4.16	X	79.99	x	0.63	x	0.7	=	101.69	(74)
North 0.9	x 0.77	x	4.8	x	79.99	X	0.63	х	0.7	=	117.33	(74)
North 0.9	x 0.77	x	4.16	X	74.68	X	0.63	х	0.7	=	94.94	(74)
North 0.9	x 0.77	x	4.8	X	74.68	x	0.63	x	0.7	=	109.55	(74)
North 0.9	x 0.77	x	4.16	x	59.25	x	0.63	x	0.7	=	75.32	(74)
North 0.9	x 0.77	x	4.8	X	59.25	Х	0.63	Х	0.7	=	86.91	(74)
North 0.9	x 0.77	x	4.16	x	41.52	х	0.63	х	0.7		52.78	(74)
North 0.9	x 0.77	×	4.8	х	41.52		0.63	x	0.7		60.9	(74)
North 0.9	x 0.77	×	4.16	x	24.19	x	0.63	x	0.7	=	30.75	(74)
North 0.9	x 0.77	×	4.8	x	24.19	х	0.63	x	0.7	<u> </u>	35.48	(74)
North 0.9	x 0.77	「x	4.16	x	13.12	×	0.63	x	0.7	-	16.68	(74)
North 0.9	x 0.77	×	4.8	х	13.12	x	0.63	x	0.7		19.24	(74)
North 0.9	x 0.77	×	4.16	X	8.86	X	0.63	x	0.7	=	11.27	(74)
North 0.9	x 0.77	×	4.8	x	8.86	x	0.63	x	0.7		13	(74)
West 0.9	x 0.77	×	2.72	x	19.64	x	0.63	x	0.7	=	16.33	(80)
West 0.9	x 0.77	x	2.72	x	38.42	X	0.63	x	0.7	=	31.94	(80)
West 0.9	x 0.77	x	2.72	x	63.27	X	0.63	х	0.7	=	52.6	(80)
West 0.9	x 0.77	×	2.72	x	92.28	x	0.63	x	0.7	=	76.71	(80)
West 0.9	x 0.77	×	2.72	X	113.09	X	0.63	x	0.7		94.01	(80)
West 0.9	x 0.77	×	2.72	x	115.77	x	0.63	x	0.7		96.24	(80)
West 0.9	x 0.77	×	2.72	x	110.22	x	0.63	x	0.7	_ =	91.62	(80)
West 0.9	x 0.77	×	2.72	x	94.68	X	0.63	x	0.7		78.7	(80)
West 0.9	x 0.77	×	2.72	x	73.59	x	0.63	x	0.7	_ =	61.17	(80)
West 0.9	x 0.77	x	2.72	x	45.59	x	0.63	x	0.7		37.9	(80)
West 0.9	x 0.77	×	2.72	x	24.49	x	0.63	x	0.7	=	20.36	(80)
West 0.9	× 0.77	×	2.72	x	16.15	x	0.63	x	0.7		13.43	(80)
						-						
Solar gains	in watts, calcu	ulated	for each mon	th		(83)m	n = Sum(74)m .	(82)m			_	
(83)m= 45.4		47.15	228.59 298.6		15.26 296.11	240	.93 174.86	104.13	56.28	37.7		(83)
			(84)m = (73) r	<u> </u>							7	
(84)m= 434.5	56 474.69 52	21.88	583.43 633.3	6 6	30.61 598.82	549	.32 493.44	442.8	418	416.6	J	(84)

7 Me	ean inter	nal temr	perature	(heating	ı season)								
	perature	·				•	from Tal	ole 9. Th	1 (°C)				21	(85)
•	ation fac	Ū	٠.			Ū		J.O O, 111	. (0)					(00)
Otino	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.91	0.77	0.61	0.67	0.9	0.98	1	1		(86)
Mear	internal	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				l	
(87)m=	19.62	19.75	20	20.35	20.69	20.91	20.98	20.96	20.79	20.38	19.94	19.6		(87)
Temr	perature	durina h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9. T	h2 (°C)	•			l	
(88)m=	19.87	19.87	19.87	19.88	19.88	19.89	19.89	19.89	19.89	19.88	19.88	19.87		(88)
Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)		!			ı	
(89)m=	1	0.99	0.99	0.96	0.87	0.67	0.47	0.53	0.83	0.97	0.99	1		(89)
Mear	internal	l temper	ature in	the rest	of dwelli	ina T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)			l	
(90)m=	18.04	18.23	18.59	19.11	19.57	19.83	19.88	19.88	19.71	19.15	18.52	18.02		(90)
									1	fLA = Livin	g area ÷ (4) =	0.37	(91)
Mear	n internal	l temper	ature (fo	r the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	A) x T2			'		'
	18.63	18.79	19.11	19.57	19.98	20.23	20.29	20.28	20.11	19.61	19.05	18.61		(92)
Apply	/ adjustn	nent to the	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opri <mark>ate</mark>				
(93)m=	18.63	18.79	19.11	19.57	19.98	20.23	20.29	20.28	20.11	19.61	19.05	18.61		(93)
8. Sp	ace hea	ting requ	uirement											
	i to the r					ned at st	ep 11 of	Table 9	o, <mark>s</mark> o tha	nt Ti <mark>,m=(</mark>	76)m an	d re-calc	ulate	
tne u	tilisation	Feb	or gains Mar			lun	lul	Aug	Sep	Oct	Nov	Dec		
Utilis	Jan_ ation fac			Apr	May	Jun	Jul	Aug	Зер	Oct	INOV	Dec		
(94)m=	1	0.99	0.98	0.96	0.87	0.71	0.52	0.59	0.85	0.97	0.99	1		(94)
Usefu	ىــــــــا يا gains,	hmGm .	, W = (9 ²	1)m x (8	4)m	<u> </u>		<u> </u>		<u> </u>	ļ.			
(95)m=	432.62	471.22	513.72	557.68	554.1	445.04	311.51	321.98	418.44	429.37	414.62	415.07		(95)
Mont	hly 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)
	loss rate					Lm , W :	=[(39)m	x [(93)m	– (96)m]		1	ı	
	1271.15				723.24	487.18	319.26	335.28	522.1	786.17		1267.35		(97)
-	e heating										r	004.00		
(98)m=	623.86	509.67	446.59	270.41	125.84	0	0	0	0	265.46	455.35	634.09	0004.00	(00)
_								lota	ı per year	(kWh/year	r) = Sum(9	8)15,912 =	3331.28	(98)
Spac	e heating	g require	ement in	kWh/m²	²/year								47.59	(99)
	ergy red		nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heating ion of sp	_	nt from so	econdar	v/supple	mentary	v system						0	(201)
	-		at from m			,	,	(202) = 1	- (201) =				1	(202)
Fract													•	\ - /
	-			-	` '			(204) = (2	02) x [1 –	(203)] =			1	(204)
Fract	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =				(204)
Fract Effici	-	tal heatii main spa	ng from	main syste	stem 1 em 1	g systen	n, %	(204) = (2	02) × [1 –	(203)] =			93.5 0	

	Jun Jul	Aug	Sep O	ct Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above)		<u> </u>		40 455.05	T 00 4 00		
623.86 509.67 446.59 270.41 125.84	0 0	0	0 265	46 455.35	634.09		(5.4.1)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ (667.23 545.1 477.63 289.21 134.59 $	0 0	0	0 283	91 487.01	678.17		(211)
001.20 0.0.1 117.00 200.21 10.100	<u> </u>		(kWh/year) =S			3562.87	(211)
Space heating fuel (secondary), kWh/month							_
= {[(98)m x (201)] } x 100 ÷ (208)							
(215)m= 0 0 0 0 0	0 0	0 Total	$\begin{array}{c c} 0 & C \\ \hline \text{(kWh/year)} = S \end{array}$	-	0	_	7(045)
Water booting		TOlai	(KVVII/year) =3	um(213) _{15,10}	12	0	(215)
Water heating Output from water heater (calculated above)							
	38.13 132.81	145.53	145.21 163	27 172.45	184.9		_
Efficiency of water heater			<u> </u>		,	79.8	(216)
` '	79.8 79.8	79.8	79.8 86	1 87.29	87.84		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m							
` '	173.1 166.43	182.37	181.96 189	62 197.57	210.49		_
		Total	= Sum(219a) ₁			2275.03	(219)
Annual totals Space heating fuel used, main system 1				kWh/yea	r	kWh/year 3562.87	7
Water heating fuel used						2275.03] 7
						2275.03	_
Electricity for pumps, fans and electric keep-hot							(222.)
central heating pump:					30		(230c)
boiler with a fan-assisted flue					45		(230e)
Total electricity for the above, kWh/year		sum (of (230a)(230	(g) =		75	(231)
Electricity for lighting						321.47	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =	=			6234.37	(338)
12a. CO2 emissions – Individual heating systems	s including mi	icro-CHP					
	Energy		Em	ission fac	ctor	Emissions	
	kWh/year		kg (CO2/kWh		kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.216	=	769.58	(261)
Space heating (secondary)	(215) x			0.519	=	0	(263)
Water heating	(219) x			0.216	=	491.41	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =			1260.99	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.519	=	38.93	(267)
Electricity for lighting	(232) x			0.519	=	166.84	(268)
Total CO2, kg/year							
			sum of (265)(271) =	İ	1466.76	(272)
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3			sum of (265)(271) =		1466.76	(272)
TER =			sum of (265)(271) =		1466.76	(272)

SAP Input

Address:

England Located in:

Region: South East England

UPRN:

Date of assessment: 26 July 2019 Date of certificate: 15 June 2022

New dwelling design stage Assessment type:

None of the above Transaction type:

Unknown Tenure type: Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: House Detachment: Mid-terrace 2019 Year Completed:

Floor Location: Floor area:

129 m² Floor 0 3 m

30 m² (fraction 0.233) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nan	ne:	Source	e:	Typ	oe:	GI	lazing:		Arg	on: I	rame:
DOO	R	Manufac	cturer	Solid	d					\	Vood
N		Manufac	cturer	Wind	dows	lov	w-E, En = 0.0	5, soft co	oat No		
S		Manufad	cturer	Wind	dows	lov	W-E, $En = 0.0$	5, soft co	oat No		

Storey height:

Name:	Gap:	Frame Fa	ctor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
N		0.7	0.4	1	12.3	1
S		0.7	0.4	1	10.3	1

Type-Name: Location: Orient: Width: Height: Name: **DOOR** Worst case S Ν 0 Ν North 0 S S South 0

More than average Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
N	42	12.3	29.7	0.15	0	False	N/A
S	44	12.7	31.3	0.15	0	False	N/A
Roof	46	0	46	0.11	0		N/A
Exposed	46			0.11			N/A
Internal Elements	3						

Party Elements

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

SAP Input

Ventilation: Pressure test:

Yes (As designed)

Ventilation:

Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system:

None

water neating

Water heating:

From main heating system

Water code: 901
Fuel: mains gas
No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Rhstesvalteric €arbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma I		2		Strom Softwa				Vorsio	on: 1.0.5.51	
Software Name.	Stroma	- SAF 201		roperty	Address			1	VEISIO	JII. 1.0.5.51	
Address :				Toperty .	Address	. House	Sample	•			
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor					129	(1a) x		3	(2a) =	387	(3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	n)	129	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	387	(5)
2. Ventilation rate:											
	main heatin		econdar neating	ry	other		total			m³ per hou	ır
Number of chimneys	0	+ [0	7 + [0	= [0	X 4	40 =	0	(6a
Number of open flues	0	+	0	Ī + Ē	0	j = <u>c</u>	0	x	20 =	0	(6b
Number of intermittent fa	ans					 	0	x .	10 =	0	 (7a
Number of passive vents	3					F	0	x	10 =	0	` (7b
Number of flueless gas f						F	0	X 4	40 =	0	(7c
Nulliber of flueless gas i	1163					L	0			0	(/0
									Air ch	nanges <mark>per</mark> h	our
Infilt <mark>ration</mark> due to chimne	ys, flues and	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l	been carried ou	t or is intend	ed, procee	ed to (17), o	otherwise o	continue fr	om (9) to ((16)			
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)
Additional infiltration) OF famata al		(12 12 12 12 12 12 12 12 12 12 12 12 12 1	. O OF fa				[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0 if both types of wall are p						•	uction			0	(11
deducting areas of openi	ings); if equal u	ser 0.35				·					
If suspended wooden		,	led) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, er	,									0	(13
Percentage of window Window infiltration	s and doors	draught s	rippea		0.25 - [0.2	v (14) ± 1	1001 -			0	(14
Infiltration rate					(8) + (10)	, ,	-	+ (15) =		0	(15
Air permeability value,	. a50. expres	sed in cub	oic metre						area	3	= (17
If based on air permeabi				•	•	•				0.15	(18
Air permeability value applie	-						is being u	sed			
Number of sides sheltered	∍d									2	(19
Shelter factor					(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21
Infiltration rate modified			1	1. 1	1	0		NI.	D	1	
Jan Feb	Mar Apı		Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
Monthly average wind sp		1	20	1 20	0.7	4	4.0	A F	4.7	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	:2)m ÷ 4										
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.16	otion rate	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1	
Calculate effec		change i	-	he appli	· ·	l -							
If mechanica	ıl ventila	tion:										0.5	(23
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [1 – (23c)) ÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (2	23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole he if (22b)m				•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural v				•	•				0.5]			_	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
2 Heat lance	and be	ot loss										_	
3. Heat losses					Not An		Aust	_	A X I I		la comba		A V I.
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-valu kJ/m²·		A X k kJ/K
)oo <mark>rs</mark>					2.4	x	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				12.3	X	1/[1/(1)+	0.04] =	11.83	Ħ			(27
Vindows Type	2				10.3	X	1/[1/(1)+	0.04] =	9.9	Ħ			(27
loor					46	×	0.11		5.06	5 ,			(28
Valls Type1	42		12.3		29.7		0.15	=	4.46	=			(29
Valls Type2	44		12.7	=	31.3	x	0.15	= =	4.7	룩 ;		-	(29
Roof	46		0	=	46	X	0.11		5.06	륵 ;			(30
otal area of e					178	╡ ^	0.11		3.00				(31
for windows and			ffective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	ıe)+0.041 a	ns aiven in	paragrapi	h 3.2	(31
* include the area						a.co a a.og	, romana i	1(", • " a.a.	,	.c g	paragrap.	0.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				44.36	(33
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	4718	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35
or design assess an be used instea				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge				using Ap	pendix k	<						26.7	(36
details of therma	,	•			•							20.1	(
otal fabric hea			, ,	,	,			(33) +	(36) =			71.06	(37
entilation hea	t 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= 34.14	33.73	33.32	31.29	30.88	28.85	28.85	28.44	29.66	30.88	31.7	32.51]	(38
leat transfer c	oefficier	nt, W/K			•	•	•	(39)m	= (37) + (3	38)m	•	-	
ioat tialioloi o									· · · · · · · · · · · · · · · ·				
39)m= 105.2	104.79	104.39	102.35	101.94	99.91	99.91	99.5	100.72	101.94	102.76	103.57		

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 0.82	0.81	0.81	0.79	0.79	0.77	0.77	0.77	0.78	0.79	0.8	0.8		
	!	!		<u> </u>	<u> </u>	ļ	!		Average =	Sum(40) ₁	12 /12=	0.79	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		89		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	5% if the c	lwelling is	designed i	` ,		se target o		2.89		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 113.18	109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07	113.18		
										im(44) ₁₁₂ =		1234.72	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 167.85	146.8	151.48	132.07	126.72	109.35	101.33	116.28	117.67	137.13	149.69	162.55		
If inst <mark>antane</mark> ous w	vator hoati	ng at nain	of use (no	hot water	r etorago)	ontor O in	haves (46		Total = Su	rm(45) ₁₁₂ =		1618.91	(45)
	_												(40)
(46)m= 25.18 Water storage	22.02	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
Storage volum		includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h													()
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact			•										
Hot water store If community h	•			ie∠(Kvv	n/iitre/aa	iy)				0.	.02		(51)
Volume factor	_		011 4.5							1	.03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro	m wate	r storage	. kWh/ve	ear			(47) x (51)) x (52) x ((53) =		.03		(54)
Enter (50) or		_	,,						,	-	.03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												ix H	(-0)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
				<u>l</u>	30.30	32.01	32.01	30.30	02.01	<u> </u>			, ,
Primary circuit	•	,			FO)	(EO) 00	SE . (44)				0		(58)
Primary circuit (modified by				,	•	` '	, ,		r tharma	netat)			
(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)
(38)111= 23.20	21.01	23.20	ا لا.22	23.20	ا لا.22	23.20	23.20	22.31	23.20	22.31	23.20		(53)

Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	35 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	То	0	0	0		(61)
	L leat regi	Lired for	water he	eating ca	Lulated	l for eac	L h month	(62)m	= 0.85 × 0	L (45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m=	223.12	196.73	206.76	185.56	182	162.85	156.61	171.55		192.41	203.18	217.83		(62)
	HW input o	calculated	using App	endix G or	· Appendix	t H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	Į.	
						applies						3,		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	[(63)
FHRS	21.02	18.78	19.29	17.15	16.54	14.49	13.5	15.33	15.49	17.72	19.1	20.46	I	(63) (G2)
Output	from w	ater hea	ter											
(64)m=	199.43	175.52	184.79	165.81	162.77	145.76	140.43	153.55	153.08	172	181.49	194.68		
								Ou	tput from w	ater heate	r (annual)₁	12	2029.31	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	100.03	88.75	94.59	86.71	86.36	79.15	77.91	82.88	81.92	89.82	92.57	98.27		(65)
inclu	ide (57)	m in cald	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	g or hot w	ater is fı	om com	munity h	' leating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
		ıs (Table		·										
Wiotab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62		(66)
Lightin	g gains	(calcula	ted in Ar	pendix l	L, equat	ion L9 o	r L9a), a	lso see	Table 5				J	
(67)m=	27.82	24.71	20.09	15.21	11.37	9.6	10.37	13.48	18.1	22.98	26.82	28.59		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5			1	
(68)m=	296.51	299.59	291.83	275.33	254.49	234.91	221.83	218.75	_	243.01	263.85	283.43		(68)
Cookir	ng gains	(calcula	ited in A	pendix	L, equa	tion L15	or L15a), also s	see Table	5			ı	
(69)m=	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	l	(69)
Pumps	and fai	ns gains	(Table 5			!		!	_ !	!	!		ı	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	E.a. ev	aporatio	n (negat	ive valu	es) (Tab	ole 5)	<u> </u>	l .	-1		!		1	
	-115.69	. 	-115.69	-115.69		-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69		(71)
Water	Leating	gains (T	able 5)			<u> </u>	ļ	!	1	<u> </u>	<u> </u>		1	
(72)m=	134.45	Ť	127.14	120.43	116.07	109.94	104.72	111.4	113.78	120.72	128.56	132.08		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	1)m + (72)	m	1	
(73)m=	525.16	-	505.45	477.35	448.32	420.83	403.31	410.02	424.76	453.09	485.61	510.49		(73)
6. So	lar gains	S:						<u> </u>						
			using sola	r flux from	Table 6a	and assoc	iated equa	itions to d	convert to th	ne applicat	ole orientat	ion.		
Orienta		Access F		Area		Flu			g_		FF		Gains	
	٦	Table 6d		m²		Tal	ole 6a		Table 6b	Т	able 6c		(W)	
North	0.9x	0.77	X	12.	.3	x 1	0.63	x	0.4	x	0.7	=	25.38	(74)
North	0.9x	0.77	X	12.	.3	x 2	0.32	x	0.4	x	0.7	=	48.5	(74)
North	0.9x	0.77	X	12.	.3	x 3	4.53	x	0.4	x	0.7	=	82.41	(74)
North	0.9x	0.77	X	12.	.3	x 5	5.46	x	0.4	x	0.7	=	132.38	(74)

	_		_		_		_						
North	0.9x	0.77	X	12.3	X	74.72	X	0.4	X	0.7	=	178.32	(74)
North	0.9x	0.77	X	12.3	X	79.99	X	0.4	X	0.7	=	190.9	(74)
North	0.9x	0.77	X	12.3	X	74.68	X	0.4	X	0.7	=	178.23	(74)
North	0.9x	0.77	X	12.3	X	59.25	X	0.4	X	0.7	=	141.4	(74)
North	0.9x	0.77	X	12.3	X	41.52	X	0.4	X	0.7	=	99.09	(74)
North	0.9x	0.77	X	12.3	X	24.19	X	0.4	X	0.7	=	57.73	(74)
North	0.9x	0.77	X	12.3	X	13.12	X	0.4	×	0.7	=	31.31	(74)
North	0.9x	0.77	X	12.3	X	8.86	X	0.4	x	0.7	=	21.16	(74)
South	0.9x	0.77	X	10.3	X	46.75	X	0.4	x	0.7	=	93.44	(78)
South	0.9x	0.77	X	10.3	x	76.57	X	0.4	x	0.7	=	153.03	(78)
South	0.9x	0.77	X	10.3	X	97.53	X	0.4	X	0.7	=	194.93	(78)
South	0.9x	0.77	X	10.3	X	110.23	X	0.4	x	0.7	=	220.32	(78)
South	0.9x	0.77	X	10.3	X	114.87	X	0.4	X	0.7	=	229.58	(78)
South	0.9x	0.77	x	10.3	X	110.55	X	0.4	x	0.7	=	220.94	(78)
South	0.9x	0.77	x	10.3	X	108.01	X	0.4	x	0.7	=	215.87	(78)
South	0.9x	0.77	x	10.3	x	104.89	x	0.4	×	0.7		209.64	(78)
South	0.9x	0.77	x	10.3	x	101.89	X	0.4	×	0.7	_ =	203.63	(78)
South	0.9x	0.77	X	10.3	X	82.59	Х	0.4	X	0.7		165.06	(78)
Sout <mark>h</mark>	0.9x	0.77	X	10.3	X	55.42	x	0.4	x	0.7	=	110.76	(78)
Sout <mark>h</mark>	0.9x	0.77	x	10.3	х	40.4	, x	0.4	x	0.7	_ =	80.74	(78)
	_						7						
Solar g	ains in	watts, <mark>calcu</mark> l	ated	for each mor	nth		(83)m	n = Sum(74)m	.(<mark>8</mark> 2)m			_	
Solar g (83)m=	ains in 118.82		ated 7.35	for each mor 352.69 407.9		11.84 394.1	(83)m 351		.(82)m 222.7		101.9		(83)
(83)m =	118.82	201.53 277	7.35		1 4		Ť				101.9		(83)
(83)m =	118.82	201.53 277 nternal and s	7.35	352.69 407.9	m + (Ť	.05 302.72		9 142.07	101.9]	(83) (84)
(83)m= [Total ga (84)m= [118.82 ains — ii 643.98	201.53 277 nternal and s 724.28 78	7.35 solar 2.8	352.69 407.9 (84)m = (73)	01 4 m + (22 8	83)m , watts	351	.05 302.72	222.7	9 142.07	<u> </u>		` ,
(83)m= [Total ga (84)m= [7. Mea	118.82 ains — il 643.98 an inter	201.53 277 nternal and s 724.28 78 nal temperat	7.35 solar 2.8 ture (352.69 407.5 (84)m = (73) 830.04 856.2 (heating seas	on)	83)m , watts	351 761	.05 302.72	222.7	9 142.07	<u> </u>	21	` ,
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(83)m= Total gas (84)m= Total gas (84)m= Tempor Utilisa (86)m= Tempor (88)m= Utilisa (89)m= Mean	ains – in 643.98 en interesture tion face Jan 20.14 erature 20.24 tion face 1 interna	201.53 277 Internal and s 724.28 78 Inal temperal during heati etor for gains Feb N 1 0.9 I temperature 20.25 20 during heati 20.24 20 etor for gains 1 0.9 I temperature 1 0.9 I temperature 20.10 I temperature 1 0.9 I temperature	r.35 respectively.	352.69 407.5 (84)m = (73) 830.04 856.2 (heating seaseriods in the leaving area, h1 Apr Ma 0.98 0.94 iving area T1 20.67 20.8 eriods in rest 20.26 20.2 est of dwellin 0.97 0.88 the rest of dwellin	on) iving ,m (s y (follo 7 2 of dw 6 2 g, h2 elling	area from Talee Table 9a) Jun Jul 0.74 0.55 w steps 3 to 7 velling from Ta velling from Ta 20.28 20.28 m (see Table 0.67 0.46 T2 (follow ste	761 761 A 0.9 7 in 1 2 20.0 9 9a) 0.0 9 pps 3	.05 302.72 .07 727.48 .07 727.48 .08 Sep .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85	222.7 675.8 Oct 0.98 20.69 20.26	9 142.07 8 627.68 Nov 1 20.38	Dec 1 20.12 20.25	21]	(84) (85) (86) (87) (88) (89)
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(83)m=	an interestion factors of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of 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whole de 20.04 20.3	on) iving ,m (say) (follo 7 2 g, h2 3 2 welling 3 2	area from Talee Table 9a) Jun Jul 0.74 0.55 w steps 3 to 7 20.98 21 velling from Ta 20.28 20.28 m (see Table 0.67 0.46 T2 (follow ste 20.26 20.27	761 761 761 761 761 761 761 761 761 761	.05 302.72 .07 727.48 .07 727.48 .08 Sep .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .09 0.85 .00 0.85 .00 0.85 .00 0.85 .00 0.85 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(93)m= 19.32 19.47 19.71 20.04 20.3 20.43 20.44 20.44 20.39 20.08 19.65	19.3 (93)
(93)m= 19.32 19.47 19.71 20.04 20.3 20.43 20.44 20.44 20.39 20.08 19.65 8. Space heating requirement	19.5
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	To calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains, hm:	
(94)m= 1 1 0.99 0.97 0.88 0.68 0.48 0.53 0.81 0.97 1	1 (94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 643.03 721.7 775.18 801.93 755.87 566.92 382.69 400.15 586.34 657.23 625.28 (611.73 (95)
Monthly average external temperature from Table 8	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
	1564.29 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	
	708.7
Total per year (kWh/year) = Sum(98)	15,912 = 3437.68 (98)
Space heating requirement in kWh/m²/year	26.65 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community sche	me.
Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat so	ources; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	
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 heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	3437.68
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	3609.56 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (309)
Water heating Annual water heating requirement	2029.31
If DHW from community scheme:	2029.31
Water heat from Community heat pump $ (64) \times (303a) \times (305) \times (306) = $	2130.78 (310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(31	10e)] = 57.4 (313)
Cooling System Energy Efficiency Ratio	0 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =	0 (315)
Electricity for pumps and fans within dwelling (Table 4f):	
mechanical ventilation - balanced, extract or positive input from outside	230.17 (330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =		230.17	(331)
Energy for lighting (calculated in Appendix L)				491.27	(332)
Total delivered energy for all uses (307) + (309) + (310) + (31	2) + (315) + (331) + (33	32)(237b) =		6461.77	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy	Emission fact			
	kWh/year	kg CO2/kWh	кg	CO2/year	
CO2 from other sources of space and water heating (not CHF	P)				
	sing two fuels repeat (363) to	(366) for the second	fuel	256	(367a)
CO2 associated with heat source 1 [(307b	b)+(310b)] x 100 ÷ (367b) x	0.52	= [1163.76	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [29.79	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	= [1193.56	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [0	(374)
CO2 associated with water from immersion heater or instanta	neous heater (312) x	0.22	= [0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			1193.56	(376)
CO2 associated with electricity for pumps and fans within dwe	el <mark>ling (331)) x</mark>	0.52	=	119.46	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= [254.97	(379)
Energy saving/generation technologies (333) to (334) as appl	icable		_		_
Item 1		0.52 × 0.01	=	0	(380)
T (1000 I (1000)					」` ′ ¬
Total CO2, kg/year sum of (376)(382) =				1567.98	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.15	(384)

El rating (section 14)

(385)

87.92

				User D	etails:						
Assessor Name:	0 /	-0 A D 00 A			Strom				.,	40554	
Software Name:	Stroma I	FSAP 201	_		Softwa			1	Versic	n: 1.0.5.51	
Addross :			F	roperty	Aaaress	: House	Sample	1			
Address: 1. Overall dwelling dime	ensions:										
n everall aweiling all ne	priorono.			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor						(1a) x		3	(2a) =	387	, (3a
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1ı	n)	129	(4)			_		
` Dwelling volume	, , , ,	, , , ,	, ,	´ <u></u>)+(3c)+(3c	d)+(3e)+	.(3n) =	387	(5)
2. Ventilation rate:											(-/
2. Ventuation rate.	main heatin		econdaneating	ry	other		total			m³ per hou	ır
Number of chimneys	0	+ [0	+	0	= [0	X e	40 =	0	(6a
Number of open flues	0	+	0	Ī + Ē	0	=	0	x :	20 =	0	(6b
Number of intermittent fa	ans					Ī	4	x	10 =	40	(7a
Number of passive vents	3					Ī	0	x	10 =	0	(7b
Number of flueless gas f	ires					Ī	0	X ·	40 =	0	(70
						_			A in a b	anges ner b	
		d force (6	(6b) (7	70) + (7b) + (70) -					nanges per h	_
Infiltration due to chimne If a pressurisation test has be						continue fr	40		÷ (5) =	0.1	(8)
Number of storeys in t			Ju, procee	u 10 (17),	<i>30110111100</i> 1	Jonana II	0111 (0) 10 ((10)		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0	.25 for stee	or timber	frame of	0.35 fo	r mason	y consti	ruction			0	(11
if both types of wall are p deducting areas of openi			ponding to	the great	er wall are	a (after					
If suspended wooden	• / .		led) 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	tripped							0	(14
Window infiltration					0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16
Air permeability value,				•	•	•	etre of e	envelope	area	5	(17
If based on air permeabi	-									0.35	(18
Air permeability value applie		ation test ha	s been do	ne or a de	gree air pe	rmeability	is being u	sed			–
Number of sides sheltere Shelter factor	∌a				(20) = 1 -	[0.075 x (*	19)] =			2	(19
Infiltration rate incorpora	ting shelter	factor			(21) = (18		. •/]			0.85	(20
Infiltration rate modified	•		4		,=., (10	, (==) =				0.3	(21
Jan Feb	Mar Ap	 	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1 3411	1 501	ı nug	l oob	1 000	1 .407	1 200	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		
		-1	1		1	ı	1	1		Į	
Wind Factor (22a)m = (2		1 4 00	I 0.05	I 0.05	I		1 4 00	1 440	4.40	1	
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35		
alculate effec		U	rate for t	he appli	cable ca	se	<u>!</u>			ļ	<u>I</u>		
If mechanica												0	(23
If exhaust air h		0		, ,	,	. `	,, .	`) = (23a)			0	(2:
If balanced with		•	•	•		,						0	(2:
a) If balance		i				- 	- ^ `	<u> </u>		` 	1 ` ` `	÷ 100]	-
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance		i				, , ,	i ,	<u> </u>	, 	` 	T -	I	(0
4b)m= 0	0	0	0	0		0	0	0	0	0	0		(2
c) If whole h				•	•		on from (c) = (22k		E (221	٥)			
4c)m = 0	0.5 x	0	0	0 = (231)	0	0	$\frac{C}{C} = (221)$	0	0	0	0		(2
											, ·		(2
d) If natural if (22b)n							0.5 + [(2		0.5]				
4d)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)	•		•		
5)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
2 Lloot loops	and be	at loss											
B. Heat losse	s and ne				Net Ar	200	U-valı	10	AXU		k-value		ΑΧk
LEMENT	area		Openin m		A ,r		W/m2		(W/		kJ/m²-l		kJ/K
oors					2.4	x	1	=	2.4				(2
/in <mark>dows</mark> Type	1				12.3	x1.	/[1/(1.4)+	0.04] =	16.31	Ħ			(2
/indows Type	2				10.3	x1	/[1/(1.4)+	0.04] =	13.66	Ħ			(2
oor					46	×	0.13	=	5.98	5 1		7 –	(2
/alls Type1	42		12.3		29.7	x	0.18	=	5.35	=		7 H	(2
/alls Type2	44		12.7	=	31.3	=	0.18	_	5.63	-		╡┝	(2
oof	46	_	0	=	46	^x	0.13	_	5.98	ᆿ ¦		╡	(3
otal area of e						╡^	0.13		3.90				(3
for windows and			ffective wi	ndow H-v	178 alue calcul	l lated using	n formula 1	/[(1/Ll-valı	ıe)+0 041 :	as given ir	naragranh	132	(0
include the area						atou uomg	, romaia r	I mo vale	10) 10.0 1] (ao givoirii	, paragrapi	. 0.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				55.3	(3
eat capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	4718	(3
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assess				construct	ion are no	t known pr	recisely the	indicative	values o	f TMP in T	able 1f		
an be used inste				ioina An	n an div l	/							——,,
hermal bridge	•	,			-	^						8.9	(3
details of therma otal fabric he		are not kn	OWII (30) =	= 0.03 X (3	(1)			(33) +	(36) =			64.2	(3
entilation hea		alculated	l monthly	/						(25)m x (5)	01.2	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 73.22	72.86	72.5	70.83	70.51	69.05	69.05	68.78	69.62	70.51	71.15	71.81		(3
eat transfer of	nefficie	nt \///K			I	I		(39)m	= (37) + ((38)m	1	ı	
	,つし 1110101	it, VV/[]						(55)111	-(01) -(Jujili			
9)m= 137.42	137.06	136.7	135.03	134.71	133.26	133.26	132.99	133.82	134.71	135.35	136.01		

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		
` /		<u> </u>						<u> </u>	L Average =	Sum(40) _{1.}	₁₂ /12=	1.05	(40)
Number of day	s in mo	nth (Tab	le 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
-												•	
4 Motor boot	ing one	ravi koani	romont								kWh/ye	oor!	
4. Water heat	ing ene	rgy requi	rement.								KVVII/ye	tai.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		89		(42)
Annual averag Reduce the annua not more that 125	l average	hot water	usage by	5% if the a	welling is	designed t			se target o		2.89		(43)
		· ·					۸	Con	Oat	Nov	Daa		
Jan Hot water usage ir	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
						1	, ,			T=		1	
(44)m= 113.18	109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07	113.18		
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b. 1		1234.72	(44)
(45)m= 167.85	146.8	151.48	132.07	126.72	109.35	101.33	116.28	117.67	137.13	149.69	162.55		
(43)111= 107.03	140.0	131.40	132.07	120.72	109.55	101.55	110.20			m(45) ₁₁₂ =		1618.91	(45)
If inst <mark>antane</mark> ous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar = Su	III(43)112 =		1010.91	(40)
(46)m= 25.18	22.02	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
Water storage	loss:											I	
Stor <mark>age volum</mark>	e (litres)	includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot water	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage												·	
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufact			-									I	
Hot water stora If community h	•			e∠(KVV	n/litre/da	ıy)					0		(51)
Volume factor	_		011 4.3								0		(52)
Temperature fa			2b							—	0		(53)
Energy lost fro				oor			(47) x (51)) v (52) v (53) -			 	, ,
Enter (50) or (_	, KVVII/yt	zai			(41) X (31)	/ X (32) X (55) =		0 .75		(54) (55)
Water storage	, ,	•	or each	month			((56)m = (55) v (41):	m		.73	l	(00)
						i	,, , ,	, , ,	ı	l		I	(50)
(56)m= 23.33 If cylinder contains	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	iv Li	(56)
	ueulcale	u solai sio			x [(30) – (· · · · · · · · · · · · · · · · · · ·	o), eise (5	7)111 = (30)	ılı wilele (1111) 15 110	T Append	IX 11	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	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	i loss cal	lculated	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 h	neat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	214.44	188.89	198.08	177.16	173.32	154.44	147.93	162.87	162.76	183.72	194.78	209.15		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '(D' if no sola	r contribu	tion to wate	er heating)	•	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	t from w	ater hea	ter										_	
(64)m=	214.44	188.89	198.08	177.16	173.32	154.44	147.93	162.87	162.76	183.72	194.78	209.15		_
								Out	put from wa	ater heate	er (annual)	12	2167.53	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 >	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	93.08	82.48	87.64	79.99	79.41	72.43	70.97	75.94	75.2	82.87	85.84	91.32		(65)
inclu	ıde (57)ı	m in cald	culation o	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. In	ternal ga	ains (see	Table 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=	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62	144.62		(66)
Lightin	ng gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	2 7.12	24.09	19.59	14.83	11.09	9.36	10.11	13.15	17.64	22.4	26.15	27.87		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m=	296.51	299.59	291.83	275.33	254.49	234.91	221.83	218.75	226.5	243.01	263.85	283.43		(68)
Cookir	ng gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a)	, also s	ee Table	5				
(69)m=	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46	37.46		(69)
Pumps	s and far	ns gains	(Table 5	āa)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)								
(71)m=	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69	-115.69		(71)
Water	heating	gains (T	able 5)									-		
(72)m=	125.11	122.74	117.8	111.09	106.74	100.6	95.39	102.07	104.44	111.39	119.23	122.75		(72)
Total i	internal	gains =				(66)	m + (67)m	ı + (68)m	+ (69)m + ((70)m + (7	71)m + (72))m		
(73)m=	518.13	515.8	498.61	470.64	441.7	414.25	396.71	403.35	417.97	446.18	478.61	503.43		(73)
6. So	lar gains	S:												
Solar (gains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	e applical	ble orientat	tion.		
Orient		Access F Table 6d		Area m²		Flu Tal	x ole 6a	-	g_ Fable 6b	Т	FF able 6c		Gains (W)	
North	0.9x	0.77	х	12	.3	x 1	0.63	x	0.63	x	0.7	=	39.97	(74)
North	0.9x	0.77	х	12	.3	x 2	0.32	х	0.63	x	0.7	=	76.39	(74)
North	0.9x	0.77	х	12	.3	x 3	34.53	х	0.63	x	0.7	=	129.8	(74)
North	0.9x	0.77	x	12	.3	x 5	55.46	x	0.63	_ x [0.7		208.49	(74)
	L												•	_

North	0.9x	0.77	x	12.3	X	74.72	x	0.63	x	0.7	=	280.86	(74)
North	0.9x	0.77	x	12.3	X	79.99	X	0.63	X	0.7	=	300.67	(74)
North	0.9x	0.77	x	12.3	X	74.68	x	0.63	х	0.7	=	280.71	(74)
North	0.9x	0.77	x	12.3	X	59.25	X	0.63	X	0.7	=	222.71	(74)
North	0.9x	0.77	X	12.3	X	41.52	X	0.63	X	0.7	=	156.06	(74)
North	0.9x	0.77	x	12.3	x	24.19	x	0.63	X	0.7	=	90.93	(74)
North	0.9x	0.77	x	12.3	X	13.12	X	0.63	X	0.7	=	49.31	(74)
North	0.9x	0.77	x	12.3	x	8.86	T x	0.63	x	0.7	_ =	33.32	(74)
South	0.9x	0.77	x	10.3	X	46.75	X	0.63	X	0.7	=	147.17	(78)
South	0.9x	0.77	x	10.3	X	76.57	X	0.63	X	0.7	=	241.02	(78)
South	0.9x	0.77	x	10.3	x	97.53	x	0.63	x	0.7	=	307.02	(78)
South	0.9x	0.77	x	10.3	X	110.23	X	0.63	x	0.7	=	347	(78)
South	0.9x	0.77	x	10.3	X	114.87	x	0.63	x	0.7	=	361.59	(78)
South	0.9x	0.77	x	10.3	x	110.55	X	0.63	x	0.7	=	347.98	(78)
South	0.9x	0.77	x	10.3	x	108.01	x	0.63	x	0.7	=	340	(78)
South	0.9x	0.77	x	10.3	x	104.89	X	0.63	x	0.7	=	330.19	(78)
South	0.9x	0.77	x	10.3	x	101.89	X	0.63	x	0.7	=	320.72	(78)
South	0.9x	0.77	x	10.3	X	82.59	Х	0.63	X	0.7		259.96	(78)
South	0.9x	0.77	Īx	10.3	x	55.42	x	0.63	х	0.7	=	174.44	(78)
South	0.9x	0.77	Īx	10.3	x	40.4	j x	0.63	х	0.7	=	127.17	(78)
							7						
				(a la		(02)-	0(74)	(00)				
Solar g	ains in	watts, calcul	ated	for each mon	IUN		(83)11	n = Sum(74)m.	(82)m				
Solar g (83)m=			ated 6.82	555.49 642.4		48.65 620.71	552		(82)m 350.89	9 223.75	160.49]	(83)
(83)m=	187.14	317.41 436	6.82		5 6		``		. ,	9 223.75	160.49		(83)
(83)m=	187.14	317.41 436 nternal and	6.82	555.49 642.4	5 6 n + (552	2.9 476.78	. ,		160.49]	(83) (84)
(83)m= [Total ga (84)m= [187.14 ains — i 705.27	317.41 436 nternal and s 833.21 938	5.82 solar 5.43	555.49 642.4 (84) m = (73) r	n + (83)m , watts	552	2.9 476.78	350.89		<u> </u>		, ,
(83)m= Total gas (84)m= 7. Mea	187.14 ains — i 705.27 an inter	317.41 436 nternal and 8 833.21 938 rnal tempera	5.82 solar 5.43 ture (555.49 642.4 (84)m = (73)r 1026.13 1084.	n + (15 10 on)	83)m , watts 062.91 1017.42	956	2.9 476.78 .24 894.75	350.89		<u> </u>	21	, ,
(83)m= [Total g: (84)m= [7. Me: Tempe	187.14 ains — i 705.27 an inter	317.41 436 nternal and s 833.21 938 nal tempera during heati	5.82 solar 5.43 ture (555.49 642.4 (84)m = (73)r 1026.13 1084. heating seas	n + (n + (15 10 on) iving	83)m , watts 062.91 1017.42 area from Ta	552 956 able 9	2.9 476.78 .24 894.75	350.89		<u> </u>	21	(84)
(83)m= [Total g: (84)m= [7. Me: Tempe	187.14 ains — i 705.27 an inter	317.41 436 nternal and s 833.21 938 rnal tempera during heati	5.82 solar 5.43 ture (555.49 642.4 (84)m = (73)r 1026.13 1084. (heating seaseriods in the I	n + (n + (15 10 on) iving ,m (s	83)m , watts 062.91 1017.42 area from Ta	956 956 sble 9	2.9 476.78 .24 894.75	350.89	3 702.36	<u> </u>	21	(84)
(83)m= [Total g: (84)m= [7. Me: Tempe	187.14 ains – i 705.27 an inter erature tion fac	317.41 436 nternal and s 833.21 938 mal tempera during heati ctor for gains Feb A	solar 5.43 ture (ng po	555.49 642.4 (84)m = (73)r 1026.13 1084. heating seaseriods in the I ving area, h1	n + (n + (15 10 on) iving ,m (s	83)m , watts 062.91 1017.42 area from Ta ee Table 9a)	956 956 sble 9	2.9 476.78 .24 894.75 , Th1 (°C) ug Sep	350.89 797.08	3 702.36	663.92	21	(84)
(83)m= Total graph (84)m= Temporal Utilisa (86)m=	187.14 ains – i 705.27 an intererature tion facular	317.41 436 nternal and s 833.21 938 mal tempera during heati ctor for gains Feb A 1 0.	5.82 solar 5.43 ture (ng po for li	555.49 642.4 (84)m = (73)r 1026.13 1084. (heating seaseriods in the I ving area, h1 Apr Ma 0.97 0.9	n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (n + (83)m , watts 062.91 1017.42 area from Ta tee Table 9a) Jun Jul 0.74 0.56	552 956 ble 9 A	2.9 476.78 2.9 476.78 2.9 Sep 32 0.86	797.00 Oct	702.36 Nov	663.92 Dec	21	(84)
(83)m= Total graph (84)m= Temporal Utilisa (86)m=	187.14 ains – i 705.27 an intererature tion facular	317.41 436 nternal and s 833.21 938 nal tempera during heati ctor for gains Feb N 1 0.	5.82 solar 5.43 ture (ng po for li	555.49 642.4 (84)m = (73)r 1026.13 1084. (heating seaseriods in the I ving area, h1 Apr Ma	n + (n + (15 10 on) iving ,m (s	83)m , watts 062.91 1017.42 area from Ta tee Table 9a) Jun Jul 0.74 0.56	552 956 ble 9 A	2.9 476.78 2.9 476.78 2.9 Sep 0.86 Cable 9c)	797.00 Oct	Nov 1	663.92 Dec	21	(84)
(83)m= Total games (84)m= Tempor Utilisa (86)m= Mean (87)m=	187.14 ains – i 705.27 an interestature erature tion fact Jan 1 interna 19.82	317.41 436 nternal and s 833.21 938 nal tempera during heati ctor for gains Feb N 1 0. ltemperatur 19.98 20	solar 5.43 ture (ng po for li far 99 e in l	555.49 642.4 (84)m = (73)r 1026.13 1084. (heating seaseriods in the I ving area, h1 Apr Ma 0.97 0.9 iving area T1 20.53 20.79	n + (15 10 10 10 10 10 10 10 10 10 10 10 10 10	83)m , watts 062.91 1017.42 area from Ta eee Table 9a) Jun Jul 0.74 0.56 ow steps 3 to 20.95 20.99	956 able 9 A 0.6 7 in 1	2.9 476.78 2.9 476.78 2.9 Sep 0.86 2.9 20.88	797.08 797.08 Oct 0.98	Nov 1	663.92 Dec 1	21	(84)
(83)m= Total games (84)m= Tempor Utilisa (86)m= Mean (87)m=	187.14 ains – i 705.27 an interestature erature tion fact Jan 1 interna 19.82	317.41 436 nternal and s 833.21 938 mal tempera during heatietor for gains Feb N 1 0. Itemperatur 19.98 20 during heati	solar 5.43 ture (ng po for li far 99 e in l	555.49 642.4 (84) m = (73) r 1026.13 1084. heating seaseriods in the I ving area, h1 Apr Ma 0.97 0.9 iving area T1	on) on) (folloged)	83)m , watts 062.91 1017.42 area from Ta eee Table 9a) Jun Jul 0.74 0.56 ow steps 3 to 20.95 20.99	956 able 9 A 0.6 7 in 1	2.9 476.78 2.9 476.78 2.9 Sep 32 0.86 32 0.86 35 20.88 36 Th2 (°C)	797.08 797.08 Oct 0.98	Nov 1 20.12	663.92 Dec 1	21	(84)
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(93)m= 18.77						i						I	
2 Space has	18.99	19.31	19.72	20.06	20.24	20.27	20.27	20.17	19.74	19.18	18.74		(93)
•	ating requ												
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	<u> </u>		<u> </u>	iviay	Juli	Jui	Aug	Оср	001	1407	DCC		
(94)m= 1	0.99	0.98	0.95	0.86	0.67	0.48	0.53	0.8	0.96	0.99	1		(94)
Useful gains	. hmGm	. W = (94	1)m x (84	4)m		<u> </u>							
(95)m= 703.48		920.09	975.99	932.53	714.52	484.5	506.4	717.47	768.94	698.21	662.69		(95)
Monthly ave	rage exte	rnal tem	perature	from Ta	able 8	<u> </u>							
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	te for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1988.51	1 1930.48	1750.57	1460.97	1126.15	751.27	489.13	514.44	812.62	1231.81	1635.57	1977.69		(97)
Space heati	ng require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m= 956.06	740.91	617.88	349.19	144.05	0	0	0	0	344.38	674.9	978.35		
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	4805.73	(98)
Space heating	ng require	ement in	kWh/m²	/year								37.25	(99)
9a. Energy re	quiremer	nts – Indi	vidual h	eating sy	vstems i	ncluding	ı micro-C	:HP)					
Space heati		no mai	viadai ii		y otorrio r	rioraarrig		,					
Fraction of s		t from s	econdar	y/supple	mentary	system						0	(201)
Fraction of s	pace hea	at from m	nain svst	em(s)			(202) = 1 -	(201) =				1	(202)
Fraction of to							(204) = (2	02) × [1 –	(203)] =			1	(204)
									(/]				╡` ′
Efficiency of						0/						93.5	(206)
Efficiency of		ry/suppl	ementar	y neating	system	1, %						0	(208)
				N/ov	LID	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Jan	Feb	Mar	Apr	May	Jun		7 10 9	Ocp	• • •				
Space heating	ng require	ement (c	alculate	d above)								·	~ .
Space heatii	ng require 740.91	ement (c 617.88	alculated	d above)		0	0	0	344.38	674.9	978.35		-
Space heatin 956.06 (211)m = {[(98	740.91 740.91 8)m x (20	ement (c 617.88 (4)] } x 1	alculated 349.19 00 ÷ (20	d above) 144.05 06)	0	0	0	0	344.38				(211)
Space heatii	740.91 740.91 8)m x (20	ement (c 617.88	alculated	d above)			0	0	344.38 368.32	721.82	1046.37		(211)
Space heatin 956.06 (211)m = {[(98 1022.53	740.91 8)m x (20 792.42	ement (c 617.88 (4)] } x 1 660.84	349.19 00 ÷ (20 373.46	d above) 144.05 16) 154.07	0	0	0	0	344.38 368.32	721.82	1046.37	5139.82	
Space heatin 956.06 (211)m = {[(96 1022.53] Space heatin	740.91 8)m x (20 792.42	ement (c 617.88 (4)] } x 1 660.84	alculated 349.19 00 ÷ (20 373.46 y), kWh/	d above) 144.05 16) 154.07	0	0	0	0	344.38 368.32	721.82	1046.37	5139.82	(211)
Space heating 956.06 (211)m = {[(96) 1022.53] Space heating = {[(98)m x (2) 1022.53]	740.91 8)m x (20 792.42 ng fuel (s	ement (c 617.88 [4)] } x 1 660.84 econdar 00 ÷ (20	alculated 349.19 00 ÷ (20 373.46 y), kWh/ 8)	d above) 144.05 16) 154.07 month	0	0	0 O Tota	0 0 I (kWh/yea	344.38 368.32 ar) =Sum(2	721.82 211) _{15,1012}	1046.37	5139.82	(211)
Space heatin 956.06 (211)m = {[(96 1022.53] Space heatin	740.91 8)m x (20 792.42	ement (c 617.88 (4)] } x 1 660.84	alculated 349.19 00 ÷ (20 373.46 y), kWh/	d above) 144.05 16) 154.07	0	0	0 Tota	0 0 I (kWh/yea	344.38 368.32 ar) =Sum(2	721.82 211) _{15,1012}	1046.37		(211)
Space heating 956.06 (211)m = {[(98) m x (2015)m= 0]	ng require 740.91 8)m x (20 3 792.42 ng fuel (s (01)] } x 1	ement (c 617.88 [4)] } x 1 660.84 econdar 00 ÷ (20	alculated 349.19 00 ÷ (20 373.46 y), kWh/ 8)	d above) 144.05 16) 154.07 month	0	0	0 Tota	0 0 I (kWh/yea	344.38 368.32 ar) =Sum(2	721.82 211) _{15,1012}	1046.37	5139.82	(211)
Space heatin 956.06 (211)m = {[(98)	ng require 740.91 8)m x (20 B 792.42 ng fuel (s (01)] } x 1 0	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20	alculated 349.19 00 ÷ (20 373.46 y), kWh/ 8)	d above) 144.05 166) 154.07 month	0	0	0 Tota	0 0 I (kWh/yea	344.38 368.32 ar) =Sum(2	721.82 211) _{15,1012}	1046.37		(211)
Space heatin 956.06 (211)m = {[(98)	ng require 740.91 8)m x (20 8 792.42 ng fuel (s 01)] } x 1 0 g water hea	ement (c 617.88 4)] } x 1 660.84 econdar; 00 ÷ (20 0	alculated 349.19 00 ÷ (20 373.46 y), kWh/ 8) 0	d above) 144.05 16) 154.07 month 0	0 0	0 0	0 Tota	0 I (kWh/yea	344.38 368.32 ar) =Sum(2 0 ar) =Sum(2	721.82 211) _{15,1012} 0	1046.37		(211)
Space heatin 956.06 (211)m = {[(98)	ng require 740.91 8)m x (20 3 792.42 ng fuel (s (01)] } x 1 0 g vater hea	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20 0	alculated 349.19 00 ÷ (20 373.46 y), kWh/ 8)	d above) 144.05 166) 154.07 month	0	0	0 Tota	0 0 I (kWh/yea	344.38 368.32 ar) =Sum(2	721.82 211) _{15,1012}	1046.37	0	(211) (211) (215)
Space heatin 956.06 (211)m = {[(98) 1022.53]} Space heatin = {[(98)m x (2) (215)m= 0} Water heatin Output from v 214.44 Efficiency of v	ng require 740.91 8)m x (20 3 792.42 ng fuel (s (01)] } x 1 0 g vater hea	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20 0	alculated 349.19 00 ÷ (20 373.46 y), kWh/ 8) 0	d above) 144.05 166) 154.07 month 0 173.32	0 0	0 0	0 Tota	0 I (kWh/yea	344.38 368.32 ar) =Sum(2 0 ar) =Sum(2	721.82 211) _{15,1012} 0	1046.37		(211) (211) (215)
Space heatin 956.06 (211)m = {[(98)	mg require 740.91 8)m x (20 8 792.42 mg fuel (s 01)] } x 1 0 g vater hear 188.89 vater hear 88.1	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20 0 ter (calc 198.08 tter	alculated 349.19 00 ÷ (20 373.46 y), kWh/8) 0 ulated al 177.16	d above) 144.05 16) 154.07 month 0	0 0	0 0 0	0 Tota 0 Tota 162.87	0 I (kWh/yea 0 I (kWh/yea 162.76	344.38 368.32 ar) =Sum(2 0 ar) =Sum(2	721.82 211) _{15,1012} 0 215) _{15,1012}	0 = 209.15	0	(211) (211) (215)
Space heatin 956.06 (211)m = {[(98)	ng require 740.91 8)m x (20 3 792.42 ng fuel (s 01)] } x 1 0 g vater hea 188.89 vater hea 88.1 r heating,	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20 0 ter (calc 198.08 tter 87.65 kWh/mc	alculated 349.19 00 ÷ (20 373.46 y), kWh/8) 0 ulated al 177.16 86.59 onth	d above) 144.05 166) 154.07 month 0 173.32	0 0	0 0 0	0 Tota 0 Tota 162.87	0 I (kWh/yea 0 I (kWh/yea 162.76	344.38 368.32 ar) =Sum(2 0 ar) =Sum(2	721.82 211) _{15,1012} 0 215) _{15,1012}	0 = 209.15	0	(211) (211) (215)
Space heatin 956.06 (211)m = {[(98)	ng require 740.91 8)m x (20 8 792.42 ng fuel (s 001)] } x 1 0 g vater hea 188.89 vater hea 88.1 r heating,)m x 100	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20 0 ter (calc 198.08 tter 87.65 kWh/mc	alculated 349.19 00 ÷ (20 373.46 y), kWh/8) 0 ulated al 177.16 86.59 onth	d above) 144.05 166) 154.07 month 0 173.32	0 0	0 0 0	0 Tota 0 Tota 162.87	0 I (kWh/yea 0 I (kWh/yea 162.76	344.38 368.32 ar) =Sum(2 0 ar) =Sum(2	721.82 211) _{15,1012} 0 215) _{15,1012}	0 = 209.15	0	(211) (211) (215)
Space heatin 956.06 (211)m = {[(98)	ng require 740.91 8)m x (20 8 792.42 ng fuel (s 001)] } x 1 0 g vater hea 188.89 vater hea 88.1 r heating,)m x 100	ement (c 617.88 (4)] } x 1 660.84 econdary 00 ÷ (20 0 ter (calconders) 198.08 econdary 00 ÷ (20 0	alculated 349.19 00 ÷ (20 373.46 y), kWh/8 0 ulated al 177.16 86.59 onth m	d above) 144.05 166) 154.07 month 0 173.32	0 0 0 154.44 79.8	0 0 0 147.93	0 Tota 162.87 79.8	0 0 I (kWh/yea 162.76	344.38 368.32 ar) =Sum(2 0 183.72 86.47	721.82 211) _{15,1012} 0 215) _{15,1012} 194.78	1046.37 = 0 = 209.15	0	(211) (211) (215)
Space heatin 956.06 (211)m = {[(98)	mg require 740.91 8)m x (20 8 792.42 mg fuel (s 01)] } x 1 0 g vater hea 188.89 vater hea 88.1 r heating, m x 100 214.4	ement (c 617.88 (4)] } x 1 660.84 econdary 00 ÷ (20 0 ter (calconders) 198.08 econdary 00 ÷ (20 0	alculated 349.19 00 ÷ (20 373.46 y), kWh/8 0 ulated al 177.16 86.59 onth m	d above) 144.05 166) 154.07 month 0 173.32	0 0 0 154.44 79.8	0 0 0 147.93	0 Tota 162.87 79.8	0 0 (kWh/yea 0 (kWh/yea 162.76 79.8 203.96	344.38 368.32 0 0 183.72 86.47 212.48 19a) ₁₁₂ =	721.82 211) _{15,1012} 0 215) _{15,1012} 194.78	1046.37 = 0 = 209.15 88.41	79.8	(211) (211) (215) (216) (217)
Space heatin 956.06 (211)m = {[(98)	mg require 740.91 8)m x (20 8 792.42 mg fuel (s)01)] } x 1 0 g vater hea 188.89 vater hea 88.1 r heating, m x 100 214.4	ement (c 617.88 (4)] } x 1 660.84 econdar 00 ÷ (20 0 ter (calcontent of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the conte	alculated 349.19 00 ÷ (20 373.46 y), kWh/8 0 ulated al 177.16 86.59 onth m	d above) 144.05 166) 154.07 month 0 173.32 84.33	0 0 0 154.44 79.8	0 0 0 147.93	0 Tota 162.87 79.8	0 0 (kWh/yea 0 (kWh/yea 162.76 79.8 203.96	344.38 368.32 0 0 183.72 86.47 212.48 19a) ₁₁₂ =	721.82 211) _{15,1012} 0 215) _{15,1012} 194.78 87.86	1046.37 = 0 = 209.15 88.41	79.8	(211) (211) (215) (216) (217)

					,
Water heating fuel used				2550.98	_
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				478.94	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =			8244.74	(338)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	1110.2	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	551.01	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1661.21	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	248.57	(268)
Total CO2, kg/year TER =	sum	n of (265)(271) =		1948.71	(272)

SAP Input

Address:

Located in: **England**

Region: South East England

UPRN:

Date of assessment: 26 July 2019 15 June 2022 Date of certificate:

New dwelling design stage Assessment type:

None of the above Transaction type:

Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Medium

True Water use <= 125 litres/person/day:

498 PCDF Version:

Dwelling type: House Mid-terrace Detachment: 2019 Year Completed:

Floor Location: Floor area:

> Storey height: 129 m² 3 m

Floor 0

30 m² (fraction 0.233) Living area: Unspecified

Front of dwelling faces:

Opening types:

Nar	ne:	Source:	Type:	Glazing:		Argon:	Fra	ame:
DOO	R	<u>Manuf</u> acture	er Solid				Woo	od
Ν		Manufacture	er Windows	low-E, $En = 0.05$	s, soft coat	No		
S		Manufacture	er Windows	low-E, $En = 0.05$	s, soft coat	No		
Ε		Manufacture	er Windows	low-E, $En = 0.05$	s, soft coat	No		

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
DOOR	mm	0.7	0	1.4	2.4	1
N		0.7	0.4	1	12.3	1
S		0.7	0.4	1	10.3	1
F		0.7	0.4	1	7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
DOOR		S	Worst case	0	0
N		N	North	0	0
S		S	South	0	0
E		E	East	0	0

Overshading: More than average

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
N	42	12.3	29.7	0.15	0	False	N/A
S	44	12.7	31.3	0.15	0	False	N/A
E	91	7	84	0.15	0	False	N/A
Roof	46	0	46	0.11	0		N/A
Exposed	46			0.11			N/A

Internal Elements

Party Elements

SAP Input

Thermal bridges

Thermal bridges: No information on thermal bridging (y=0.15) (y=0.15)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community heat pump

heat from electric heat pump, heat fraction 1, efficiency 256

Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature >45°C

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and TRVs

Control code: 2306

Secondary heating system

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder

Flue Gas Heat Recovery System:

Database (rev 498, product index 060036)

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015

Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Rhstesvalteric €arbon Home: No

				User D	etails:						
Assessor Name: Software Name:	Stroma	FSAP 201	2		Strom Softwa				Versio	on: 1.0.5.51	
John Ware Hame.	Otroma	10/11 201		roperty	Address			2	VOISIO	71. 1.0.0.01	
Address :				roporty .	rtaarooo	110000	Campio	_			
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor					129	(1a) x		3	(2a) =	387	(3a
Total floor area TFA = (1	a)+(1b)+(1c	c)+(1d)+(1e	e)+(1ı	n)	129	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	387	(5)
2. Ventilation rate:											
	main heatir		econdar neating	у	other		total			m³ per hou	ır
Number of chimneys	0		0] + [0	=	0	X 4	40 =	0	(6a
Number of open flues	0	- +	0	Ī + Ē	0	ī - Ē	0	x	20 =	0	(6b
Number of intermittent fa	ans					,	0	x .	10 =	0	 (7a
Number of passive vents	3					L	0	x	10 =	0	` (7b
Number of flueless gas f						Ļ			40 =	-	=
Nulliber of flueless gas f	1163					L	0		10 -	0	(70
									Air ch	nanges <mark>per</mark> h	our
Infiltration due to chimne	ys, flues an	d fans = (6	a)+(6b)+(7	7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has l						continue fr					` ′
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0 if both types of wall are p						•	ruction			0	(11
deducting areas of openi			portaing to	ine great	er wall are	a (anter					
If suspended wooden	floor, enter	0.2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, er	,									0	(13
Percentage of window	s and doors	draught st	tripped		0.05 [0.0	v (1.4) · .4	1001			0	(14
Window infiltration Infiltration rate					0.25 - [0.2] (8) + (10)	, ,	-	L (15) —		0	(15
Air permeability value,	a50 eynre	esed in cut	nic metre						area	0	(16
If based on air permeabi				•	•	•	ctic oi c	rivelope	arca	0.15	(18
Air permeability value applie	-						is being u	sed		0.10	(
Number of sides sheltere	ed									2	(19
Shelter factor					(20) = 1 -		19)] =			0.85	(20
Infiltration rate incorpora	•				(21) = (18) x (20) =				0.13	(21
Infiltration rate modified		- i	1	l			-			1	
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	<u> </u>		1	1	1		1		<u> </u>	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	

djusted infiltra	tion rat	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m				•	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
<i>alculate effec</i> If mechanica		-	iale ioi l	пе аррп	cable ca	13 <i>E</i>						0.5	(23
If exhaust air he	at pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				79.05	
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)		`
.4a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	лV) (24b)m = (22	2b)m + (23b)		•	
!4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole ho				•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v				•	•				0.5]	•		•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss	paramet	er:							_	_	
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
oors					2.4	х	1.4	= [3.36				(26
Vin <mark>dows</mark> Type	1				12.3	x	1/[1/(1)+	0.04] =	11.83				(2
Vindows Type	2				10.3	x	1/[1/(1)+	0.04] =	9.9				(2
Vindows Type	3	'			7	х	1/[1/(1)+	0.04] =	6.73				(2
loor					46	Х	0.11	= [5.06				(28
/alls Type1	42		12.3		29.7	Х	0.15	= [4.46				(29
/alls Type2	44		12.7		31.3	Х	0.15	= [4.7				(29
/alls Type3	91		7		84	Х	0.15	= [12.6				(29
oof	46		0		46	X	0.11	= [5.06				(30
otal area of el	ements	, m²			269								(3
for windows and include the area						lated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	3.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)) + (32) =				63.69	(3
eat capacity (•	,						((28)	(30) + (32	2) + (32a).	(32e) =	5894	(3
hermal mass	•	•		•					tive Value			250	(3:
or design assessi an be used instea	nd of a de	tailed calc	ulation.				ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge	•	,		• .	•	K					,	40.35	(3
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			104.04	4 (3
								(20)	0.00				
entilation hea	t loss ca	alculated	d monthly	/				(36)111	$= 0.33 \times ($	(25)m x (5))		

						i	ı			ī		I	4
(38)m= 34.14 33.73 33.32 31.29 30.88 28.85 28.85 28.44 29.66 30.88 31.7 32.51													(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m												l	
(39)m= 138.18	3 137.77	137.37	135.33	134.92	132.89	132.89	132.48	133.7	134.92	135.74	136.55	405.00	7(20)
Average = Sum(39) ₁₁₂ /12= Heat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $												135.23	(39)
(40)m= 1.07	1.07	1.06	1.05	1.05	1.03	1.03	1.03	1.04	1.05	1.05	1.06		_
Number of da	ave in mo	nth (Tah	(12 ما					1	Average =	Sum(40) ₁	12 /12=	1.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
												I	
4. Water he	ating one	rav roqui	romont:								kWh/ye	oor:	
4. Water ne	aling ene	rgy requi	rement.								Kvvii/ye	tal.	
Assumed occ							\		40		.89		(42)
if TFA > 13 if TFA £ 13		+ 1.76 x	[1 - exp	(-0.0003	349 x (11	-A -13.9)2)] + 0.0)013 x (IFA -13.	9)			
Annual avera	,	ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		10:	2.89		(43)
Reduce the ann	ual average	hot water	usage by	5% if the a	lwelling is	designed			e target o			ı	` /
not more that 12	25 litres per	person per	day (all w	ater use, I	not and co	la) 							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	r day for ea	ach month	Vd,m = ta	ctor from I	able 1c x	(43)				,		
(44)m= 113.18	3 109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07	113.18		_
Energy content	of hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1234.72	(44)
(45)m= 167.85	5 146.8	151.48	132.07	126.72	109.35	101.33	116.28	117.67	137.13	149.69	162.55		
									Total = Su	m(45) ₁₁₂ =	=	1618.91	(45)
If instantaneous	water heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)		1	,	1	
(46)m= 25.18	1	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
Water storag Storage volu) includin	na anv so	olar or M	/M/HRS	storane	within sa	me ves	امء		0		(47)
If community	` ,					•		arric vos.	301		U		(47)
Otherwise if	•			•			` '	ers) ente	er '0' in (47)			
Water storag			•					,	`	,			
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) =											10		(50)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02												1	
If community	-			e 2 (KVV	n/litre/da	ıy)				0.	.02		(51)
Volume factor	_		011 4.3							1	.03		(52)
Temperature			2b							-	0.6		(53)
Energy lost from water storage, kWh/year								(47) x (51) x (52) x (53) =			.03		(54)
Enter (50) or (54) in (55)											1.03		(55)
Water storag	, , ,	,	or each	month			((56)m = (55) × (41)ı	n				
(56)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												ix H	\ - <i>/</i>
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
32.01	20.32	02.01	50.30	02.01	50.50	J 02.01	02.01	55.56	02.01	1 00.90	02.01	I	(01)

Primary circuit loss (annual) from Table 3		0	(58)	
Primary circuit loss calculated for each month (59) m = $(58) \div 3$	65 × (41)m		1	
(modified by factor from Table H5 if there is solar water hear	ing and a cylinder 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 calculated for each month (61)m = (60) \div 365 × (4	I)m			
(61)m= 0 0 0 0 0 0 0	0 0 0	0 0	(61)	
Total heat required for water heating calculated for each mont	$1 (62) \text{m} = 0.85 \times (45) \text{m} + 0.85 \times (45) \text{m}$	(46)m + (57)m +	(59)m + (61)m	
(62)m= 223.12 196.73 206.76 185.56 182 162.85 156.61	171.55 171.16 192.41	203.18 217.83	(62)	
Solar DHW input calculated using Appendix G or Appendix H (negative quant	ty) (enter '0' if no solar contributi	on to water heating)	ı	
(add additional lines if FGHRS and/or WWHRS applies, see A	opendix G)			
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)	
FHRS 21.02 18.78 19.29 17.15 16.54 14.49 13.5	15.33 15.49 17.72	19.1 20.46	(63) ((G2
Output from water heater				
(64)m= 199.43 175.52 184.79 165.81 162.77 145.76 140.43	153.55 153.08 172	181.49 194.68		
	Output from water heater	(annual) ₁₁₂	2029.31 (64)	
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45))	n + (61)ml + 0.8 x [(46)m	+ (57)m + (59)m	1	
(65)m= 100.03 88.75 94.59 86.71 86.36 79.15 77.91	82.88 81.92 89.82	92.57 98.27	(65)	
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is fr	om community h	eating	
5. Internal gains (see Table 5 and 5a):	dwelling or not water le ii	on community :	eaming .	
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	1	
(66)m= 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62	144.62 144.62 144.62	144.62 144.62	(66)	
		144.02	(00)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 26.61 23.63 19.22 14.55 10.88 9.18 9.92	12.9 17.31 21.98	25.66 27.35	(67)	
	 	25.00 27.35	(07)	
Appliances gains (calculated in Appendix L, equation L13 or L	, 	000 05 000 40	(60)	
(68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83	-	263.85 283.43	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15	''		I (00)	
(69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46	37.46 37.46 37.46	37.46 37.46	(69)	
Pumps and fans gains (Table 5a)			l	
(70)m= 0 0 0 0 0 0	0 0 0	0 0	(70)	
Losses e.g. evaporation (negative values) (Table 5)			1	
(71)m= -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69	-115.69 -115.69 -115.69	-115.69 -115.69	(71)	
Water heating gains (Table 5)				
(72)m= 134.45 132.07 127.14 120.43 116.07 109.94 104.72	111.4 113.78 120.72	128.56 132.08	(72)	
Total internal gains = (66)m + (67)	m + (68)m + (69)m + (70)m + (7	1)m + (72)m	_	
(73)m= 523.96 521.68 504.58 476.69 447.82 420.41 402.86	409.43 423.98 452.1	484.45 509.25	(73)	
6. Solar gains:				
Solar gains are calculated using solar flux from Table 6a and associated equ	ations to convert to the applicab	le orientation.		
Orientation: Access Factor Area Flux	g_ Table Ch	FF	Gains	
Table 6d m ² Table 6a	Table 6b Ta	able 6c	(W)	
North 0.9x 0.77 x 12.3 x 10.63	x 0.4 x	0.7	25.38 (74)	

	_					,			, ,						_
North	0.9x	0.77		X	12.3	X	2	20.32	X	0.4	X	0.7	=	48.5	(74)
North	0.9x	0.77		X	12.3	X	3	34.53	X	0.4	X	0.7	=	82.41	(74)
North	0.9x	0.77		X	12.3	X	5	55.46	X	0.4	X	0.7	=	132.38	(74)
North	0.9x	0.77		X	12.3	X	7	4.72	X	0.4	X	0.7	=	178.32	(74)
North	0.9x	0.77		X	12.3	X	7	9.99	x	0.4	X	0.7	=	190.9	(74)
North	0.9x	0.77		X	12.3	X	7	4.68	X	0.4	X	0.7	=	178.23	(74)
North	0.9x	0.77		X	12.3	X	5	9.25	X	0.4	X	0.7	=	141.4	(74)
North	0.9x	0.77		X	12.3	X	4	1.52	X	0.4	X	0.7	=	99.09	(74)
North	0.9x	0.77		X	12.3	X	2	24.19	X	0.4	X	0.7	=	57.73	(74)
North	0.9x	0.77		X	12.3	X	1	3.12	x	0.4	X	0.7	=	31.31	(74)
North	0.9x	0.77		X	12.3	X		8.86	X	0.4	X	0.7	=	21.16	(74)
East	0.9x	0.77		X	7	×	1	9.64	x	0.4	X	0.7	=	26.68	(76)
East	0.9x	0.77		X	7	X	3	88.42	x	0.4	X	0.7	=	52.19	(76)
East	0.9x	0.77		X	7	X	6	3.27	x	0.4	X	0.7	=	85.94	(76)
East	0.9x	0.77		X	7	X	9	2.28	x	0.4	X	0.7	=	125.34	(76)
East	0.9x	0.77		X	7	X	1	13.09	x	0.4	X	0.7	=	153.61	(76)
East	0.9x	0.77		x	7	×	1	15.77	x	0.4	X	0.7	=	157.25	(76)
East	0.9x	0.77		X	7	X	1	10.22	Х	0.4	X	0.7	=	149.71	(76)
East	0.9x	0.77		X	7	х	9	94.68	x	0.4	х	0.7	_	128.6	(76)
East	0.9x	0.77		X	7	х	7	3.59	x	0.4	х	0.7	_ =	99.95	(76)
East	0.9x	0.77		X	7	X	4	5.59	x	0.4	х	0.7	=	61.92	(76)
East	0.9x	0.77		X	7	x	2	24.49	Х	0.4	х	0.7	=	33.26	(76)
East	0.9x	0.77	7	X	7	x	1	6.15	Х	0.4	х	0.7	=	21.94	(76)
Sout <mark>h</mark>	0.9x	0.77		X	10.3	x	4	6.75	х	0.4	х	0.7	=	93.44	(78)
South	0.9x	0.77		x	10.3	×	7	6.57	х	0.4	х	0.7	=	153.03	(78)
South	0.9x	0.77		X	10.3	×	9	7.53	х	0.4	x	0.7	_ =	194.93	(78)
South	0.9x	0.77		x	10.3	X	1	10.23	х	0.4	X	0.7	=	220.32	(78)
South	0.9x	0.77		X	10.3	X	1	14.87	x	0.4	x	0.7	_ =	229.58	(78)
South	0.9x	0.77		X	10.3	×	1	10.55	x	0.4	x	0.7	_ =	220.94	(78)
South	0.9x	0.77		X	10.3	×	1	08.01	x	0.4	x	0.7	_ =	215.87	(78)
South	0.9x	0.77		X	10.3	×	1	04.89	х	0.4	x	0.7	=	209.64	(78)
South	0.9x	0.77		X	10.3	x	1	01.89	х	0.4	х	0.7	=	203.63	(78)
South	0.9x	0.77		X	10.3	X	8	32.59	x	0.4	x	0.7	=	165.06	(78)
South	0.9x	0.77		X	10.3	X	5	55.42	x	0.4	X	0.7		110.76	(78)
South	0.9x	0.77		X	10.3	X		40.4	x	0.4	X	0.7		80.74	(78)
	L					-			•			•			_
T				$\overline{}$	for each mon	\neg		r	i i	= Sum(74)m				7	
(83)m=	145.49	253.72	363.2		478.03 561.5		69.09	543.81	479	.64 402.67	284.7	1 175.33	123.83		(83)
Ī	-			_	(84)m = (73) r		` '		1		T .	. 1	1.	٦	(0.1)
(84)m=	669.45	775.4	867.8	7	954.73 1009.3	34	989.5	946.67	889	.08 826.65	736.8	1 659.78	633.08		(84)
7. Mea	an inter	nal temp	eratu	re (heating seaso	on)									
•		_		•	eriods in the li	_			ble 9,	Th1 (°C)				21	(85)
Utilisa			l	$\overline{}$	ving area, h1	Ť					ı			7	
L	Jan	Feb	Ma	r	Apr Ma	у	Jun	Jul	A	ug Sep	Oc	t Nov	Dec	_	
04	O A D OO 4	0.1/	4055	- 4 /6	2AD 0 02\ http:/									_	E of 7

	_							
(86)m= 1 1 0.99 0.98 0.92 0.78 0.6 0.66 0.89 0.99 1 1	(86)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)								
(87)m= 19.79 19.93 20.16 20.48 20.76 20.94 20.99 20.98 20.86 20.5 20.09 19.77	(87)							
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)								
(88)m= 20.02 20.03 20.03 20.04 20.05 20.06 20.06 20.06 20.05 20.05 20.04 20.03	(88)							
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)								
(89)m= 1 1 0.99 0.97 0.89 0.69 0.48 0.54 0.83 0.98 1 1	(89)							
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_							
(90)m= 18.4 18.61 18.95 19.41 19.79 20.01 20.05 20.05 19.93 19.44 18.85 18.38	(90)							
fLA = Living area ÷ (4) =	0.23 (91)							
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$								
(92)m= 18.72 18.92 19.23 19.66 20.02 20.23 20.27 20.27 20.15 19.69 19.14 18.7	(92)							
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_							
(93)m= 18.72 18.92 19.23 19.66 20.02 20.23 20.27 20.27 20.15 19.69 19.14 18.7	(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-ca	lculate							
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 1 0.99 0.96 0.89 0.71 0.51 0.56 0.84 0.97 1 1	(94)							
Useful gains, hmGm , W = (94)m x (84)m	_							
(95)m= 668.11 771.82 857.43 918.83 893.77 701.16 481.51 501.71 691 717.54 656.83 632.14	(95)							
Monthly average external temperature from Table 8								
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)							
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	(07)							
(97)m= 1992.68 1930.99 1748.8 1455.69 1122.33 748.03 487.79 512.45 808.65 1226.23 1633.75 1980.0	2 (97)							
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 985.48 778.97 663.18 386.54 170.05 0 0 0 378.46 703.38 1002.8	7							
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂	-							
Space heating requirement in kWh/m²/year								
<u> </u>	39.29 (99)							
9b. Energy requirements – Community heating scheme								
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary 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. The procedure allows for CHP and up to four other heat sources.								
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	uie iauei							
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 heating system	1 (305)							
Distribution loss factor (Table 12c) for community heating system 1.05 (306)								
	` ,							
Space heating Annual space heating requirement	kWh/year 5068.89							
· · · · · · · · · · · · · · · · · · ·	5550.00							

					_
Space heat from Community heat pump)	(98) x (304a) x	(305) x (306) =	5322.33	(307a)
Efficiency of secondary/supplementary	heating system in % (fron	n Table 4a or Apper	ndix E)	0	(308
Space heating requirement from second	dary/supplementary syste	em (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2029.31]
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	2130.78	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	7e) + (310a)(310e)] =	74.53	(313)
Cooling System Energy Efficiency Ratio)			0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra		outside		230.17	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	r	=(330a) + (330	0b) + (330g) =	230.17	(331)
Energy for lighting (calculated in Appen	dix L)			469.94	(332)
Total delivered energy for all uses (307) + (309) + (310) + (312) -	+ (315) + (331) + (3	32)(237b) =	8153.21	(338)
12h CO2 Emissions Community boot	ting achomo				
CO2 from other sources of space and v Efficiency of heat source 1 (%)	vater heating (not CHP)	Energy kWh/year two fuels repeat (363) to	Emission factor kg CO2/kWh	kg CO <mark>2/yea</mark> r	(367a)
CO2 from other sources of space and v	vater heating (not CHP) If there is CHP using	kWh/year	kg CO2/kWh	kg CO2/year	(367a) (367)
CO2 from other sources of space and v Efficiency of heat source 1 (%)	vater heating (not CHP) If there is CHP using [(307b)+(3	kWh/year two fuels repeat (363) to	kg CO2/kWh (366) for the second fue	kg CO2/year 256 1511	」 ` `
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	vater heating (not CHP) If there is CHP using [(307b)+(307b)]	kWh/year two fuels repeat (363) to 810b)] x 100 ÷ (367b) x	(366) for the second fue 0.52 = 0.52 =	kg CO2/year 256 1511 38.68	(367)
CO2 from other sources of space and view of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	vater heating (not CHP) If there is CHP using [(307b)+(3	kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x 313) x	(366) for the second fue 0.52 = 0.52 =	kg CO2/year 256 1511 38.68 1549.68	(367)
CO2 from other sources of space and view of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	vater heating (not CHP) If there is CHP using [(307b)+(3 [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3)	kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(37	(366) for the second fue 0.52 = 0.52 = 2) =	kg CO2/year 256 1511 38.68 1549.68	(367) (372) (373)
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CO2 from other sources of space and vietficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see	vater heating (not CHP) If there is CHP using [(307b)+(3 [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3) [(307b)+(3)	kWh/year two fuels repeat (363) to 310b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(37 309) x ous heater (312) x 373) + (374) + (375) =	(366) for the second fue 0.52 = 0.52 = 0.52 = 0 =	kg CO2/year 256 1511 38.68 1549.68 0 1549.68	(367) (372) (373) (374) (375)
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CO2 from other sources of space and vietficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community si CO2 associated with space heating (see CO2 associated with water from immersional CO2 associated with space and with co2 associated with electricity for pumico2 associated with electricity for lighting Energy saving/generation technologies litem 1	vater heating (not CHP) If there is CHP using [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)+(3 [(307b)	kWh/year two fuels repeat (363) to (3610b)] x 100 ÷ (367b) x 313) x 363)(366) + (368)(376) x 309) x 50us heater (312) x 373) + (374) + (375) = 19g (331)) x 332))) x	(366) for the second fue 0.52 0.52 0.52 0 0 0.52 = 0.52 = 0.52 = 0.52 = 0.52	kg CO2/year 256 1511 38.68 1549.68 0 1549.68 119.46 243.9	(367) (372) (373) (374) (375) (376) (378) (379) (380)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.51 Property Address: House Sample 2 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x (2a) = (3a) 129 3 387 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)129 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =387 (5) total main secondary other m³ per hour heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a)4 40 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) 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) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2 $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85 $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (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

djusted infiltr	ation rate	e (allowi	ing for sh	nelter an	nd wind s	peed) =	(21a) x	(22a)m	•	1	T		
0.38 Calculate effec	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35		
If mechanica		•	iale ioi l	пе аррп	cable ca	3E						0	(2
If exhaust air he	eat pump ι	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	ЛV) (24t	m = (22)	2b)m + (23b)		•	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•					.5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n									0.5]	•	•		
4d)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				•	
5)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
3. Heat losse	s and he	eat loss	paramet	er:								_	
LEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	2K	(W/I	K)	kJ/m²-	<	kJ/K
oors					2.4	Х	1	=	2.4				(2
/indows Type	1				12.3	x1.	/[1/(1.4)+	0.04] =	16.31				(2
/indows Type	2				10.3	x1.	/[1/(1.4)+	0.04] =	13.66				(2
indows Type	3				7	х1.	/[1/(1.4)+	0.04] =	9.28				(2
oor					46	X	0.13	=	5.98	\Box [(2
/alls Type1	42		12.3		29.7	Х	0.18	=	5.35				(2
/alls Type2	44		12.7		31.3	X	0.18	=	5.63				(2
/alls Type3	91		7		84	x	0.18	=	15.12	₹ i		$\neg \ \ $	(2
oof	46		0		46	x	0.13	-	5.98			7 6	(:
otal area of e	lements	, m²			269								(:
or windows and						ated using	formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	3.2	
include the area				ls and par	titions		(0.0) (0.0)	(00)					
abric heat los		•	U)				(26)(30)	, , ,	4	_, ,,		79.7	(:
eat capacity	,			TEA):	/ .014			,	(30) + (32	, , ,	(32e) =	5894	
hermal mass	•	`		,					itive Value		-bl- 4£	250	(;
or design assess In be used inste				construct	ion are no	t known pr	ecisely the	e inaicative	e values of	TIVIP IN T	able 11		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						13.45	j (:
details of therma		are not kn	nown (36) =	= 0.05 x (3	31)								
otal fabric he	at loss							(33) +	(36) =			93.15	(:
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

						1	ı			1	1	l	(2.2)
(38)m= 73.22	72.86	72.5	70.83	70.51	69.05	69.05	68.78	69.62	70.51	71.15	71.81		(38)
Heat transfer of						1			= (37) + (3			l	
(39)m= 166.37	166.01	165.65	163.98	163.66	162.21	162.21	161.94	162.77	163.66	164.3	164.96		7(20)
Heat loss para	meter (l	HLP), W	m²K			i			Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	163.98	(39)
(40)m= 1.29	1.29	1.28	1.27	1.27	1.26	1.26	1.26	1.26	1.27	1.27	1.28		_
Number of day	s in mo	nth (Tab	le 1a)					/	Average =	Sum(40)₁	12 /12=	1.27	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		-	-			-	-			-	-		
4. Water heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu											.89		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.	9)			
Annual averag											2.89		(43)
Reduce the annua not more that 125	-		• .		-	-	o acnieve	a water us	e target o	ī			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								ОСР	Oct	1404	Dec		
(44)m= 113.18	109.07	104.95	100.84	96.72	92.6	92.6	96.72	100.84	104.95	109.07	113.18		
										m(44) ₁₁₂ =		1234.72	(44)
Energy content of	hot water) kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 167.85	146.8	151.48	132.07	126.72	109.35	101.33	116.28	117.67	137.13	149.69	162.55		7(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		lotal = Su	m(45) ₁₁₂ =	=	1618.91	(45)
(46)m= 25.18	22.02	22.72	19.81	19.01	16.4	15.2	17.44	17.65	20.57	22.45	24.38		(46)
Water storage									_	!		1	
Storage volum	` ,		•			Ū		ame ves	sel		150		(47)
If community horizontal of the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community has been depicted by the community of the community has been depicted by the community of the community has been depicted by the community of the community has been depicted by the community of the community of the community of the community of the community of the community of the community of the community of the community of the community of the community	-			_			, ,	ers) ente	ar '∩' in <i>(</i>	<i>4</i> 7)			
Water storage		not wate	i (uno n	iciuues i	iistaiitai	ieous co	ATIOI DOII	ers) erite	, O III (77)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48)
Temperature fa	actor fro	m Table	2b							0.	.54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	.75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	•			C Z (KVV)	i/iiti C /ua	iy <i>)</i>					0		(51)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or ((54) in (5	55)								0.	.75		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)r	n				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 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	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 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 x (45)m + (46)m + (57)m + (59)m + (61)r	m
(62)m= 214.44 188.89 198.08 177.16 173.32 154.44 147.93 162.87 162.76 183.72 194.78 209.15	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
FHRS 0 0 0 0 0 0 0 0 0 0 0 0	(63) (G2
Output from water heater	
(64)m= 214.44 188.89 198.08 177.16 173.32 154.44 147.93 162.87 162.76 183.72 194.78 209.15	
Output from water heater (annual) 112 2167.53	(64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]	
(65)m= 93.08 82.48 87.64 79.99 79.41 72.43 70.97 75.94 75.2 82.87 85.84 91.32	(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= 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62 144.62	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 26.43 23.48 19.09 14.46 10.81 9.12 9.86 12.81 17.2 21.84 25.49 27.17	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 296.51 299.59 291.83 275.33 254.49 234.91 221.83 218.75 226.5 243.01 263.85 283.43	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46 37.46	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69 -115.69	(71)
Water heating gains (Table 5)	
(72)m= 125.11 122.74 117.8 111.09 106.74 100.6 95.39 102.07 104.44 111.39 119.23 122.75	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 517.44 515.19 498.12 470.26 441.42 414.02 396.46 403.01 417.53 445.62 477.94 502.73	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m² Table 6a Table 6b Table 6c (W)	
North 0.9x 0.77 x 12.3 x 10.63 x 0.63 x 0.7 = 39.97	(74)

	_				_		_						
North	0.9x	0.77	X	12.3	X	20.32	X	0.63	X	0.7	=	76.39	(74)
North	0.9x	0.77	X	12.3	x	34.53	x	0.63	x	0.7	=	129.8	(74)
North	0.9x	0.77	X	12.3	x	55.46	x	0.63	x	0.7	=	208.49	(74)
North	0.9x	0.77	X	12.3	x	74.72	x	0.63	x [0.7		280.86	(74)
North	0.9x	0.77	x	12.3	x	79.99	x	0.63	x [0.7	=	300.67	(74)
North	0.9x	0.77	х	12.3	x	74.68	x	0.63	x	0.7	=	280.71	(74)
North	0.9x	0.77	x	12.3	x	59.25	x	0.63	x	0.7	=	222.71	(74)
North	0.9x	0.77	X	12.3	x	41.52	x	0.63	x	0.7	=	156.06	(74)
North	0.9x	0.77	X	12.3	x	24.19	x	0.63	x	0.7	=	90.93	(74)
North	0.9x	0.77	X	12.3	x	13.12	x	0.63	x [0.7		49.31	(74)
North	0.9x	0.77	X	12.3	x	8.86	x	0.63	x [0.7	=	33.32	(74)
East	0.9x	0.77	X	7	x	19.64	x	0.63	x	0.7	=	42.02	(76)
East	0.9x	0.77	X	7	x	38.42	x	0.63	x [0.7	=	82.19	(76)
East	0.9x	0.77	x	7	x	63.27	x	0.63	x [0.7	=	135.36	(76)
East	0.9x	0.77	x	7	x	92.28	x	0.63	x [0.7	=	197.41	(76)
East	0.9x	0.77	x	7	x	113.09	x	0.63	x	0.7	=	241.94	(76)
East	0.9x	0.77	х	7	x	115.77	x	0.63	x	0.7	=	247.67	(76)
East	0.9x	0.77	х	7	X	110.22	Х	0.63	Х	0.7	=	235.79	(76)
East	0.9x	0.77	x	7	х	94.68	x	0.63	х	0.7	=	202.54	(76)
East	0.9x	0.77	x	7	х	73.59	x	0.63	x	0.7	=	157.43	(76)
East	0.9x	0.77	x	7	x	45.59	x	0.63	х	0.7	=	97.53	(76)
East	0.9x	0.77	x	7	x	24.49	х	0.63	х	0.7	=	52.39	(76)
East	0.9x	0.77	x	7	x	16.15	X	0.63	х	0.7	=	34.55	(76)
South	0.9x	0.77	x	10.3	x	46.75	x	0.63	x	0.7	=	147.17	(78)
South	0.9x	0.77	X	10.3	x	76.57	x	0.63	×	0.7	=	241.02	(78)
South	0.9x	0.77	X	10.3	x	97.53	X	0.63	×	0.7	=	307.02	(78)
South	0.9x	0.77	Х	10.3	x	110.23	x	0.63	x	0.7	=	347	(78)
South	0.9x	0.77	X	10.3	x	114.87	x	0.63	×	0.7	=	361.59	(78)
South	0.9x	0.77	X	10.3	X	110.55	X	0.63	×	0.7	=	347.98	(78)
South	0.9x	0.77	Х	10.3	x	108.01	x	0.63	×	0.7	=	340	(78)
South	0.9x	0.77	X	10.3	X	104.89	x	0.63	×	0.7	=	330.19	(78)
South	0.9x	0.77	X	10.3	X	101.89	X	0.63	×	0.7	=	320.72	(78)
South	0.9x	0.77	X	10.3	x	82.59	x	0.63	×	0.7	=	259.96	(78)
South	0.9x	0.77	X	10.3	x	55.42	x	0.63	x	0.7	=	174.44	(78)
South	0.9x	0.77	X	10.3	X	40.4	X	0.63	x	0.7	=	127.17	(78)
				for each mon	$\overline{}$		Ė	n = Sum(74)m.				Ī	
(83)m=	229.15		72.18	752.9 884.3		96.32 856.5	755	.44 634.21	448.42	276.14	195.04		(83)
_				(84)m = (73) n	`				004.04	T == 4.00	007.77	Ī	(0.4)
(84)m=	746.6	!!-		1223.16 1325.8		1252.96	1158	3.45 1051.73	894.04	754.09	697.77		(84)
			•	heating seaso									
-		_	• .		_	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisa				ving area, h1,	Ť		T .	_	_	1	_		
	Jan	Feb	Mar	Apr Ma	У	Jun Jul	<u> </u>	ug Sep	Oct	Nov	Dec		
01	-0 4 D 004	0.1/	04 /6	2 A D O O O O \ http://								Dana	5 of 7

(86)m=	1	1	0.99	0.96	0.87	0.72	0.55	0.61	0.85	0.98	1	1		(86)
Mean i	internal	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.56	19.75	20.04	20.42	20.74	20.93	20.98	20.97	20.84	20.41	19.91	19.52		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	 h2 (°C)					
(88)m=	19.85	19.85	19.85	19.86	19.87	19.87	19.87	19.88	19.87	19.87	19.86	19.86		(88)
Utilisat	tion fact	or for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)			•			
(89)m=	1	0.99	0.98	0.94	0.83	0.62	0.42	0.48	0.77	0.96	0.99	1		(89)
Mean i	internal	temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)		!		
(90)m=	17.93	18.21	18.64	19.19	19.61	19.83	19.87	19.87	19.74	19.18	18.46	17.89		(90)
L									f	LA = Livin	g area ÷ (4) =	0.23	(91)
Mean i	internal	temper	ature (fo	r the wh	ole dwe	llina) = fl	A × T1	+ (1 – fL	A) x T2					
_	18.31	18.57	18.97	19.47	19.88	20.08	20.13	20.12	19.99	19.47	18.79	18.27		(92)
Apply a	adjustm	ent to t	ne mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate		ļ		
(93)m=	18.31	18.57	18.97	19.47	19.88	20.08	20.13	20.12	19.99	19.47	18.79	18.27		(93)
8. Spa	ce heat	ing requ	uirement											
						ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the util			Ť	using Ta		lun	l. d	Aug	Con	Oct	Nov	Doo		
_ Utilisat	Jan tion fact	Feb for for a	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.98	0.93	0.83	0.64	0.45	0.51	0.78	0.96	0.99	1		(94)
	gains,	hmGm .	W = (94	4)m x (84	4)m									
	743.87	906.36	1044.68			837.17	564.22	589.06	824.38	855.43	748.05	695.88		(95)
Mo <mark>nthl</mark>	ly avera	ige exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
					erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]		1		
(97)m= 2				1733.86	1338.15	889.57	572.24	602.94	959.52	1451.16	1921.41	2321.29		(97)
		<u> </u>)m – (95 I	<u> </u>	ŕ	4000 04		
(98)m= 1	1180.84	916.05	759.57	427.39	180.06	0	0	0 	0	443.22	844.81	1209.31	5004.00	(08)
_								lota	l per year	(kwh/yeai	r) = Sum(9	8)15,912 =	5961.26	(98)
Space	heating	g require	ement in	kWh/m²	/year								46.21	(99)
9a. Ene	rgy req	uiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	heatin	_			ما مسمار							ı		(204)
	•			econdary		mentary	•	(000) 4	(204)				0	(201)
	•			nain syst	• •			(202) = 1		(0.00)			1	(202)
			_	main sys				(204) = (2	02) x [1 – ((203)] =			1	(204)
	•	•		ing syste									93.5	(206)
Efficier	ncy of s	econda	ry/suppl	ementar	y heating	g system	າ, %	_			_		0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	year
· -		•		alculate										
	1180.84	916.05	759.57	427.39	180.06	0	0	0	0	443.22	844.81	1209.31		
				00 ÷ (20		1		i			·	 		(211)
	1262.93	979.73	812.38	457.1	192.57	0	0	0	0	474.04	903.54	1293.38		
								lota	ıl (kWh/yea	ıı) =5um(2	۲۱۱) _{15,1012}	=	6375.67	(211)

							•	
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		_
		Total	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating Output from water heater (calculated above)								
	4.44 147.93	162.87	162.76	183.72	194.78	209.15		
Efficiency of water heater	!						79.8	(216)
(217)m= 88.67 88.47 88.06 87.08 84.92 79	9.8 79.8	79.8	79.8	87.08	88.28	88.75		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
(219)m= 241.83 213.5 224.94 203.45 204.1 19	3.54 185.37	204.1	203.96	210.99	220.63	235.67		_
		Total	I = Sum(2°		/		2542.08	(219)
Annual totals Space heating fuel used, main system 1				K	Nh/year	ſ	kWh/year 6375.67	7
Water heating fuel used							2542.08	_
Electricity for pumps, fans and electric keep-hot							2012.00	_
central heating pump:						30		(2300
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting						_	466.84	」` ′ ☐(232)
Total delivered energy for all uses (211)(221) + (231) + (232)	(237h)					9459.59	\`/ ☐(338)
12a. CO2 emissions – Individual heating systems							0.100.100	
12d. CO2 chilosichis midividuali ileating systems		010 0111		_				
	kWh/year			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	1377.15	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	549.09	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1926.24	(265)
	(231) x			0.5	19	=	38.93	_ (267)
Electricity for pumps, fans and electric keep-hot	(== : / ::							_ ` ′
Electricity for pumps, fans and electric keep-hot Electricity for lighting	(232) x			0.5	19	=	242.29	(268)

TER =

(273)

17.11

APPENDIX 8 – COMMERCIAL LEAN BRUKL CERTIFICATES A8

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name Shell and Core

St Clare Commercial

As designed

Date: Fri May 20 07:56:06 2022

Administrative information

Building Details

Address: LEAN,,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.14

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.14

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	17.8
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	17.8
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	13
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.17	0.17	SP000005:Surf[7]
Floor	0.25	0.22	0.22	SP000005:Surf[8]
Roof	0.25	0.18	0.18	SP00000B:Surf[10]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	SP000005:Surf[0]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

^{*} There might be more than one surface where the maximum U-value occurs.

^{**} Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

^{***} Display windows and similar glazing are excluded from the U-value check.

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- VRF htg + clg

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	0.96	5.5	0	-	0.75
Standard value	0.91*	1	N/A	N/A	0.65
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for thi	is HVAC syster	n NO
* Standard shown is f	or gas single boiler system	s <=2 MW output. For sing	le boiler systems >2 MW o	r multi-boiler system	ns, (overall) limiting

efficiency is 0.86. For any individual boiler in a multi-boiler systems, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

	· · · · · · · · · · · · · · · · · · ·
ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(I/s)]								UD officionov		
ID of system type	Α	В	С	D	Е	F	G	Н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
00-Office Space 3	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Office Space 2	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Office Space 1	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 4	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 2	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 3	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Circulation	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Reception Area	-	-	-	1.8	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
00-Office Space 3	NO
00-Office Space 2	NO
00-Office Space 1	NO
00-Meeting Room 4	NO
00-Meeting Room 1	NO
00-Meeting Room 2	NO
00-Meeting Room 3	NO
00-Circulation	NO

Shell and core configuration

Zone	Assumed shell?
00-Reception Area	NO

General lighting and display lighting	Lumino	us effic	acy [lm/W]	
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00-Office Space 3	110	-	-	445
00-Office Space 2	110	-	-	699
00-Office Space 1	110	-	-	653
00-Meeting Room 4	110	-	-	268
00-Meeting Room 1	110	-	-	148
00-Meeting Room 2	110	-	-	207
00-Meeting Room 3	110	-	-	207
00-Circulation	-	110	-	100
00-Reception Area	-	110	110	173

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00-Office Space 3	NO (-40.5%)	NO
00-Office Space 2	NO (-56.2%)	NO
00-Office Space 1	NO (-53.9%)	NO
00-Meeting Room 4	N/A	N/A
00-Meeting Room 1	N/A	N/A
00-Meeting Room 2	N/A	N/A
00-Meeting Room 3	N/A	N/A
00-Circulation	NO (-96.2%)	NO
00-Reception Area	NO (-58.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	576	576
External area [m²]	931.8	931.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	268.7	362.81
Average U-value [W/m²K]	0.29	0.39
Alpha value* [%]	10	10

^{*} Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways 100

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.43	9.7
Cooling	3.3	7.27
Auxiliary	7.04	2.07
Lighting	9.35	20.57
Hot water	2.6	2.61
Equipment*	36.08	36.08
TOTAL**	32.72	42.22

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	80.61	129.26
Primary energy* [kWh/m²]	76.35	104.56
Total emissions [kg/m²]	13	17.8

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

ŀ	HVAC Systems Performance									
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2		Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
	Actual	34.2	46.4	10.4	3.3	7	0.91	3.91	0.96	5.5
	Notional	30.1	99.2	9.7	7.3	2.1	0.86	3.79		

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U i-Тур	U _{i-Min}	Surface where the minimum value occurs*	
Wall	0.23	0.13	00000000:Surf[1]	
Floor	0.2	0.22	SP000005:Surf[8]	
Roof	0.15	0.18	SP00000B:Surf[10]	
Windows, roof windows, and rooflights	1.5	1.3	SP000005:Surf[0]	
Personnel doors	1.5	-	No Personnel doors in building	
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building	
High usage entrance doors	1.5	-	No High usage entrance doors in building	
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs				

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

APPENDIX 9 – COMMERCIAL GREEN BRUKL CERTIFICATES A9

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name Shell and Core

St Clare Commercial

As designed

Date: Fri May 20 07:59:30 2022

Administrative information

Building Details

Address: GREEN HP PV,,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.14

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.14

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	17.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	17.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	9.3
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _{a-Limit}	Ua-Calc	U _{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.17	0.17	SP000005:Surf[7]
Floor	0.25	0.22	0.22	SP000005:Surf[8]
Roof	0.25	0.18	0.18	SP00000B:Surf[10]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	SP000005:Surf[0]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

^{*} There might be more than one surface where the maximum U-value occurs.

^{**} Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

^{***} Display windows and similar glazing are excluded from the U-value check.

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- VRF htg + clg

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	3	5.5	0	-	0.75	
Standard value	2.5*	1	N/A	N/A	0.65	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO						
* Standard shows in far all types >12 kW output, except shootspire and goe engine host number for types <=12 kW output, refer to EN 14025						

^{*} Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- DHWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]							UD officionous		
ID of system type	Α	В	C D E F G H I			πiciency					
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
00-Office Space 3	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Office Space 2	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Office Space 1	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 4	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 2	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Meeting Room 3	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Circulation	-	-	-	1.8	-	-	-	-	-	-	N/A
00-Reception Area	-	-	-	1.8	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
00-Office Space 3	NO
00-Office Space 2	NO
00-Office Space 1	NO
00-Meeting Room 4	NO
00-Meeting Room 1	NO

Shell and core configuration

Zone	Assumed shell?
00-Meeting Room 2	NO
00-Meeting Room 3	NO
00-Circulation	NO
00-Reception Area	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00-Office Space 3	110	-	-	445
00-Office Space 2	110	-	-	699
00-Office Space 1	110	-	-	653
00-Meeting Room 4	110	-	-	268
00-Meeting Room 1	110	-	-	148
00-Meeting Room 2	110	-	-	207
00-Meeting Room 3	110	-	-	207
00-Circulation	-	110	-	100
00-Reception Area	-	110	110	173

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00-Office Space 3	NO (-40.5%)	NO
00-Office Space 2	NO (-56.2%)	NO
00-Office Space 1	NO (-53.9%)	NO
00-Meeting Room 4	N/A	N/A
00-Meeting Room 1	N/A	N/A
00-Meeting Room 2	N/A	N/A
00-Meeting Room 3	N/A	N/A
00-Circulation	NO (-96.2%)	NO
00-Reception Area	NO (-58.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	576	576
External area [m ²]	931.8	931.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	268.7	362.81
Average U-value [W/m²K]	0.29	0.39
Alpha value* [%]	10	10

^{*} Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

100 **B1 Offices and Workshop businesses**

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.17	3.27
Cooling	2.34	7.27
Auxiliary	7.04	2.07
Lighting	9.35	20.57
Hot water	2.37	2.61
Equipment*	36.08	36.08
TOTAL**	24.28	35.79

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	6.37	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	80.61	129.26
Primary energy* [kWh/m²]	74.53	102.2
Total emissions [kg/m²]	9.3	17.6

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

B	HVAC Systems Performance									
Sys	System Type Heat dem MJ/m2 MJ/m2 Heat con kWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2 KWh/m2									
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	34.2	46.4	3.2	2.3	7	3	5.5	3	5.5
	Notional	30.1	99.2	3.3	7.3	2.1	2.56	3.79		

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U i-Тур	U _{i-Min}	Surface where the minimum value occurs*		
Wall	0.23	0.13	00000000:Surf[1]		
Floor	0.2	0.22	SP000005:Surf[8]		
Roof	0.15	0.18	SP00000B:Surf[10]		
Windows, roof windows, and rooflights	1.5	1.3	SP000005:Surf[0]		
Personnel doors	1.5	-	No Personnel doors in building		
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building		
High usage entrance doors	1.5	-	No High usage entrance doors in building		
U _{i-Typ} = Typical individual element U-values [W/(m²K)	j		U _{i-Min} = Minimum individual element U-values [W/(m²K)]		
* There might be more than one surface where the minimum U-value occurs					

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5