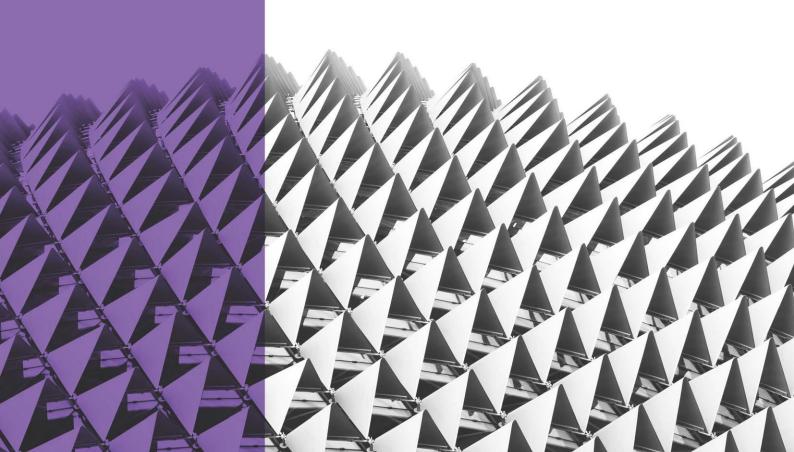


Energy Statement Tottenham Mews

14-19 Tottenham Mews, London, W1T 4AA





Title

Energy Statement Tottenham Mews

Address

14-19 Tottenham Mews, London, W1T 4AA

Client

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Report Preface



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Executive Summary

This energy strategy has been prepared on behalf of Central London Commercial Estates Limited, in support of a planning application for Tottenham Mews (hereafter referred to as the "Proposed Development"), located within the Charlotte Street Conservation Area of London.

The statement relates to the final proposals and accompanies full planning application for the development. It follows the London Plan energy hierarchy and approach to energy statements as detailed in the "GLA Guidance on preparing energy assessments" (October 2018 and draft document dated April 2020).

Energy and climate change planning policy within the London Borough of Camden currently follows the London Plan and additional energy planning guidance, with the requirement for the development to meet carbon reduction targets (e.g. 35% reduction in CO₂ emissions and 20% carbon reduction from renewables). This report also considers and addresses the emerging draft policies on energy and carbon with the aim to achieve net zero carbon in operation.

The London Plan requires that the development follows an energy hierarchy when considering reducing CO₂ emissions. The energy hierarchy must consider the incorporation of energy efficiency measures including passive design, supplying energy efficiently (with particular emphasis on decentralised energy generation including CHP) and using renewable energy technologies. The following summarises the key technical solutions that are proposed for the development:

- Utilising building materials with good thermal performance and airtightness to reduce energy demand for heating and cooling (where applicable).
- Passive solar control measures are balanced through specification of high-performance solar control glass to limit solar gains in summer and to allow useful solar gains during heating period.
- High-efficiency Heating, Ventilation and Air Conditioning (HVAC) including heat pump system to provide renewable heating and domestic hot water (DHW), cooling (B1 use only) and balanced mechanical ventilation with heat recovery.
- High performance LED lighting is adopted throughout the development with improved controls such as occupancy sensing and daylight dimming in high density areas and where appropriate.
- 53no high efficiency solar PV panels are proposed to be located on the building's roof, further contributing to carbon emissions reduction associated with the renewable technologies.

Under the Draft London Plan, it is now required that major residential and non-residential developments adhere to a zero-carbon target. To meet the zero-carbon target, new developments are required to incorporate a minimum of 35% on-site reduction of carbon beyond the 'baseline' Part L of the current Building Regulations.

Please note that the modelling inputs and results listed in this report are reflective of the design at the time of issue, the strategy is likely to be further refined as the detailed design develops.



Table 1 and Figure 1 below show estimated regulated CO₂ emissions and savings achieved at each stage of the energy hierarchy for the Proposed Development using revised carbon emission factors for fuels listed in SAP 10 Table 12.

Table 1: Estimated regulated CO₂ emissions and savings after each stage of the hierarchy

		nissions lential)	CO ₂ Emissions (Non-residential))	
Energy Hierarchy	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)
Baseline	25.0	13.4	4.5	2.5
Be Lean	23.7	13.4	3.6	2.5
Be Clean	23.7	13.4	3.6	2.5
Be Green	8.1	13.4	3.4	2.5

B 14 100 11 1	Resid	ential	Non-residential	
Regulated CO ₂ emissions savings	Tonnes CO ₂ per annum	%	Tonnes CO ₂ per annum	%
Be lean: Savings from energy demand reduction	1.3	5%	0.8	18.9%
Be clean: Savings from heat network	-	-	0.0	-
Be green: Savings from renewable energy	15.6	63%	0.3	6.1%
Total cumulative savings	16.9	68%	1.1	25.1%
Annual savings from off-set payment	8.1	-	3.4	-
Shortfall in Regulated CO ₂ savings	Tonnes CO ₂		Tonnes CO ₂	
Cumulative savings for off-set payment (over 30 years)	242	-	101	
Cash-in-lieu contribution (based on £95/tonne)	£22,973	-	£9,572	

 $\textbf{Table 2:} \ \, \textbf{Combined regulated CO}_2 \ \, \textbf{emissions and savings}$

	Total regulated emissions (tCO ₂ / year)	CO ₂ savings (tCO ₂ / year)	Percentage savings (%)
Baseline	29.4	-	-
Be Lean	27.3	2.1	7.3%
Be Clean	27.3	-	-
Be Green	11.4	15.9	54%
Total savings	-	18	61.2%
Offset (tCO ₂)	-	345	-



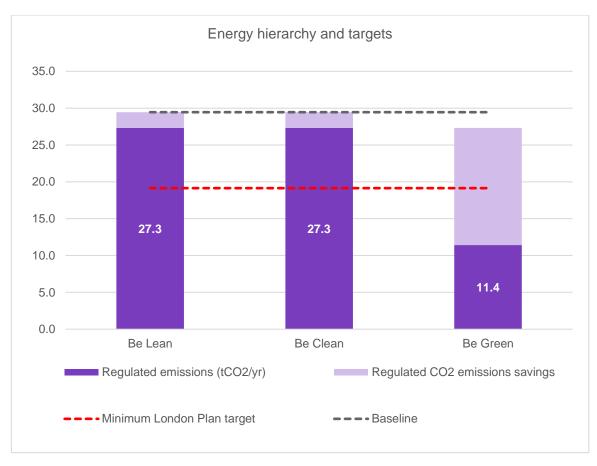


Figure 1: Estimated combined regulated CO₂ emission savings after each stage of the hierarchy

In summary, the energy strategy has enabled the Proposed Development to achieve a total of 61.2% in regulated carbon emissions when assessed using SAP 10 carbon factors. Contribution of heat pump system, as a form of renewable heat source topped by roof-mounted PV is 54% of the total CO₂ savings achieved for the development.



1.0 Introduction

Acting on behalf of Central London Commercial Estates Limited, we have prepared this energy statement to support the planning application for the redevelopment of Tottenham Mews.

The Proposed Development is situated within the London Borough of Camden. The site comprises a temporary prefabricated building dating from the 1970s, which is located on the western side of Tottenham Mews. The building is currently vacant and is soon to be demolished by the Applicant to allow the site to be utilised to facilitate the construction of the approved scheme at Middlesex Hospital Annex.

The total GIA of the Proposed Development is approximately 2,003m² and according to the GLA guidance, the Proposed Development falls within the criteria for a major development (over 10 dwellings).

To better reflect the need to mitigate the Proposed Development's impact on climate change, and to reduce its carbon dioxide (CO₂) emissions, this report will not only follow the principles set out in the current London Plan (March 2016), and Camden Local Plan (2017), it will also refer to the emerging Draft London Plan (Intention to publish, December 2019) where possible.

The report will take into account Part L1A 2013 of the UK Building Regulations, as well as identify how the design of the Proposed Development can provide energy efficiency measures that result in a minimum 35% residual carbon reduction through the consideration of renewable and low carbon energy installations.

1.1 Client

This report is for the benefit of Central London Commercial Estates Limited only; TFT cannot accept any liability to any third party for the whole or any part of its contents. Our appointment specifically excludes the provisions set out in the Contracts (Rights of Third Parties) Act 1999.

Tuffin Ferraby Taylor LLP (TFT) is a limited liability partnership registered in England and Wales. Registration number: OC306766. Registered office: 18 Holborn, London, EC1N 2LE.



2.0 Description of the Proposed Development

The proposal consists of erection of a ground plus five storey building (plus one basement level) to provide office (e class) at part ground and basement level and residential dwellings (C3) at ground and floors one to five, and associated landscaping, cycling parking and all necessary enabling works.



Figure 2: Tottenham Mews, Google Earth view



3.0 Planning Policy and Building Regulations Context

This assessment was carried out in line with local, regional and national planning requirements which encourage that passive design, energy efficiency measures, low carbon and renewable energy technologies are incorporated into the building design. Policies and regulations relevant to the Proposed Development include the following.

3.1 Building Regulations



The approved part L documents give guidance for compliance for building work carried out in England. It deals with the energy efficiency requirements in buildings and sets five different criteria to achieve compliance.

The proposals shall comply with Part L1Aand Part L2A of the UK Building Regulations 2013 (amended in 2016).

3.2 Relevant Planning Policy

GLA Planning Policy

The Greater London Authority (GLA) has set out guidance relating to sustainable design within the London Plan (Spatial Development Strategy for Greater London). The current adopted plan is dated March 2016, with alterations since 2011.

The Greater London Authority (GLA) has set out new guidance relating to sustainable design within the Draft London Plan 'Spatial Development Strategy for Greater London' (intention to publish, December 2019). In preparation for the adoption of the London Plan and to better reflect the need to mitigate the Proposed Development's impact on climate change, this report will also refer to the emerging Draft London Plan policies.

THE LONDON PLAN (MARCH 2016)

Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction are to be met within the framework of the energy hierarchy.

As a minimum, energy assessments should include the following details:

- a calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and,
- separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy

Proposals to reduce carbon dioxide emissions through the energy-efficient design of the site, buildings and services.

Proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP).

Proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring-fenced to secure the delivery of carbon dioxide savings elsewhere.



POLICY 5.2 MINIMISING CARBON DIOXIDE EMISSIONS

Development proposal should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

Be lean: use less energy.

Be clean: supply energy efficiently.

Be green: use renewable energy.

The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero-carbon non-domestic buildings from 2019.

Table 3: Year Improvement on 2010 Building Regulations

Year	Year Improvement on 2010 Building Regulations	
2011 – 2013	25 per cent	
2014 – 2016	40 per cent	
2017 – 2019	As per building regulations requirements	
2020 – 2031	Zero Carbon	

POLICY 5.6 DECENTRALISED ENERGY IN DEVELOPMENT PROPOSALS

Development proposal should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

Major development proposals should select energy systems in accordance with the following hierarchy:

- Connection to existing heating or cooling networks;
- Site wide CHP network;
- Communal heating and cooling;

Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

POLICY 5.7 RENEWABLE ENERGY

Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.

POLICY 5.9 OVERHEATING AND COOLING

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

Minimise internal heat generation through energy-efficient design



- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
- Manage the heat within the building through exposed internal thermal mass and high ceilings
- Passive ventilation
- Mechanical ventilation
- Active cooling systems (ensuring they are the lowest carbon options).

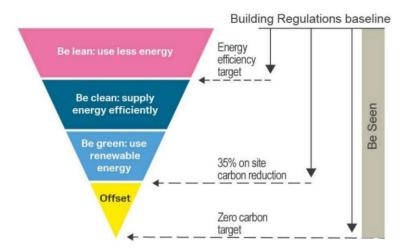
Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should also be designed to avoid the need for energy-intensive air conditioning systems as much as possible. Further details and guidance regarding overheating and cooling are outlined in the London Climate Change Adaptation Strategy.

The emerging Draft London Plan

This report will reference the following policies considered relevant to the Proposed Development:

POLICY SI2 MINIMISING GREENHOUSE GAS EMISSIONS

- A) Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:
 - Be lean: use less energy and manage demand during construction and operation.
 - Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure.
 - Be green: generate, store and use renewable energy on-site. B Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance.
 - Be seen: monitor, verify and report on energy performance.



- 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) In meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations 117 is expected. Non-residential development should aim to achieve 15 per cent through energy



efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved onsite, any shortfall should be provided:

- 1) through a cash in lieu contribution to the relevant borough's carbon offset fund, and/or
- 2) off-site provided that an alternative proposal is identified, and delivery is certain.
- D) Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver greenhouse gas reductions. The operation of offset funds should be monitored and reported on annually.

POLICY SI3 ENERGY INFRASTRUCTURE

- D) Major development proposals within Heat Network Priority Areas should have a communal heating system
- 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 available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)
 - c. generate clean heat and/or power from zero-emission sources
 - d. use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)
 - e. use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)
 - f. use ultra-low NOx gas boilers.
- 2. CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that there is no significant impact on local air quality.

Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.

POLICY SI4 MANAGING HEAT RISK

- A) Development proposal should minimise internal heat gain and the impacts of the urban heat island through design, layout, orientation and materials.
- B) Major development proposals should demonstrate through an energy strategy how they will reduce the potential for 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, albedo, fenestration, insulation and the provision of green roofs and walls
 - 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



Camden Local Plan

The Camden Council Local Plan (adopted 2017) is a document that details both strategic and more detailed policies to deliver Camden's future sustainable development. The key sustainable development policy in relation to energy is summarised below.

POLICY CC1 – CLIMATE CHANGE MITIGATION

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

- a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
- require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
- ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
- d. support and encourage sensitive energy efficiency improvements to existing buildings;
- require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
- f. expect all developments to optimise resource efficiency.
 - For decentralised energy networks, the Council will promote decentralised energy by:
- working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
- h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
- requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

As the Proposed Development is GLA-referable development project, the principles and policies summarised within this chapter were adhered to during design and associated energy strategy approach for the scheme.



4.0 Baseline Energy Demands and CO₂ Emissions

4.1 Proposed approach

The recommendations within this Energy Statement embrace the themes outlined in the Mayor's energy hierarchy defined in the London Plan:

1. Be Lean: use less energy

Be Clean: supply energy efficiently
 Be Green: use renewable energy

This approach consists of reducing the energy demand and CO_2 emissions by first improving the energy efficiency of the building envelope and the mechanical and electrical services. Once the energy demand of the building has been reduced from energy efficiency improvements, Low and Zero Carbon (LZC) technologies can then be considered. It is widely accepted that the most effective way to reduce energy consumption (and therefore carbon emissions) is to follow the energy hierarchy shown below.

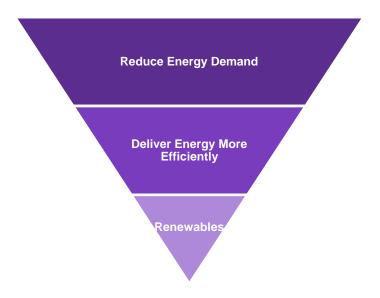


Figure 3: London Plan Energy hierarchy

4.2 Baseline assessment

In order to assess the potential CO_2 emissions reductions achievable at the site through the implementation of passive design, energy efficiency measures and on-site LZC technologies, the baseline CO_2 emissions of the Proposed Development must be estimated.

As a new build construction, the Proposed Development will need to meet the minimum criteria set out in Part L1A and L2A of the Building Regulations and Building Services Compliance Guide 2013.



5.0 Be Lean - Passive Design & Energy Efficiency Appraisal

A key component of this energy strategy is to demonstrate how energy efficiency can be maximised within the Proposed Development, through passive design and efficient servicing. The measures included within the design are described in greater detail below.

5.1 Building fabric improvements



The proposed building fabric will be designed to exceed the requirements set out in Part L 2013. Please note that these requirements will need to be confirmed by building control and adapted in case of a change in Building Regulations in the future.

The table below summarises the U-Values for the opaque elements of the scheme:

Table 4: Proposed building fabric performance

Element	Proposed U-value (W/m²K)	Part L1A 2013 recommended U-value (W/m²K)
External Walls	0.20	0.30
Exposed Floor	0.12	0.25
Main Roof	0.14	0.20
Windows (including frame)	1.1	2.0
Windows g-value	0.44	N/A
Air permeability	3m³/m²/h	10 ³ /m ² /h

5.2 Proposed building services

High-efficiency services will be provided throughout the building and the target design criteria assumed in the thermal modelling exercise are summarised in the table below:

Table 5: Proposed building services performance

Efficient lighting



The following measures will be introduced to reduce energy consumption associated with lighting:

- Energy-efficient LED lamps across office floor plates with high efficacy.
- Daylight dimming and occupancy sensing in communal areas and B1 spaces.



Heating & Cooling



- High efficiency air source heat pumps to provide heating to the building's occupied areas.
- Heating COP: 2.5

Ventilation



- Local MVHR units with low SFP of 0.48-0.61W/l/s
- High heat recovery efficiency up to 80%.

DHW



- High efficiency heat pump for DHW provision with SCOP of 2.5.
- Thermally insulated heat interface units within the apartments.

5.3 Cooling hierarchy



In line with Policy 5.2 of the London Plan (March 2016) and Policy SI4 of the emerging Draft London Plan the Proposed Development will be designed to be adaptable to the changing climate, with emphasis given on incorporating features to mitigate overheating, whilst reducing reliance on air conditioning systems.

The following table illustrates how the Proposed Development follows the cooling hierarchy to ensure energy use associated with cooling is minimised.

Table 6: Cooling hierarchy measures

Hierarchy Steps	Measures applied
Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.	Selective solar control glazing (high light transmittance with low g-values) has been specified to prevent the excessive solar gains in summer. Fabric insulation and airtightness levels have been improved above Building Regulations requirements to reduce heat gains in the summer.
2. Minimise internal heat generation through energy efficient design	Internal heat gains have been minimised where possible through energy efficient lighting design with automatic daylight and occupancy controls where applicable. Heat losses from distribution pipework and HIUs have also been significantly reduced through specification of high-performance pipe insulation.



3. Manage the heat within the building through exposed internal thermal mass and high ceilings	The thermal mass of the occupied areas will absorb heat gains during the day through the use of concrete slab, internal masonry walls and structural columns. Ceiling height is maintained at 2.4m minimum to improve air circulation and reduce overheating risks.
4. Provide passive ventilation	Although there are certain limitations associated with urban constraints (noise/pollution), the design includes manually openable windows. These will be supplemented by efficient mechanical ventilation system for fresh air provision.
5. Provide mechanical ventilation	Mechanical ventilation with high efficiency heat recovery system has been specified. Ventilation plant has been designed to avoid excessively long duct runs and increased fan power. The system will circulate fresh air in the occupied zones and remove hot stale air from wet rooms. Boost mode operation of MVHR and summer bypass would also be available to increase fresh air supply during hot summer months.
6. Provide active cooling systems	No active cooling is specified for the residential element of the Proposed Development. High efficiency air source heat pump is specified for B1 office unit offering active cooling solution at the Proposed Development. High cooling efficiency (SEER=4.0) and previous steps of the cooling hierarchy have enabled to reduce energy demand for cooling by 40% against the Notional Building target, as can be seen in Table 7 below.

Table 7: Cooling demand

	Area-weighted non-domestic cooling demand (MJ/m²)	Total non-domestic cooling demand (MJ/year)
Actual	42.1	11,375
Notional	70.7	19,103

5.4 Overheating assessment

A detailed overheating assessment following CIBSE TM59 methodology has been undertaken for the Proposed Development and it indicates no risk of overheating based on the proposed design parameters using recommended DSY1 2020 weather file.

In line with the GLA's 'Energy Assessment Guidance 2018' (section 9.4, table 11) a full dynamic thermal model has been used to demonstrate that summer operative temperature ranges in occupied zones are in accordance with the criteria set out in CIBSE TM59 and TM49.

The simulation has been undertaken on the basis of current climatic data as well as predicted future climatic data in order to investigate the resilience of the design with regards to climate change.

A selection of apartments (highlighted in green below) within the Proposed Development have been assessed to understand whether there is a potential risk of overheating under varying climate scenarios.



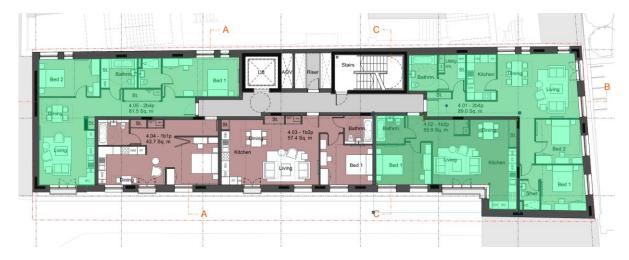




Figure 4: Apartments tested

This analysis has been undertaken to test a thermal model of the proposed development using CIBSE 'Design Summer Years' (DSY) weather files for the London Weather Centre location 'London_LWC_DSY'.

The following weather files were simulated for this analysis as per requirements outlined within the Energy Assessment Guidance:

- CIBSE LWC DSY1 (Moderately warm summer): 2020 high emissions, 50% scenario
- CIBSE LWC DSY2 (Short, intense warm spell): 2020 high emissions, 50% scenario
- CIBSE LWC DSY3 (Long, less intense warm spell): 2020 high emissions, 50% scenario

In addition, the following future projected weather files have been analysed:

- CIBSE LWC DSY1 (Moderately warm summer): 2050 medium emissions, 50% scenario
- CIBSE LWC DSY1 (Moderately warm summer): 2080 medium emissions, 50% scenario

CIBSE TM59 outlines the following compliance criteria for predominantly naturally ventilated homes. Both must be achieved for all relevant rooms.

Criterion A – Living rooms, kitchens and bedrooms



The number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

Criterion B – Bedrooms only

To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

The developments where communal heating system is present it is recommended to undertake the overheating test for corridors. It should be based on the number of annual hours for which an operative temperature of 28 °C is not exceeded for more than 3% of the total hours.

Table 8 below provides a simplified summary breakdown of data input into the thermal model based on TM59 requirements. It includes internal gains (occupancy density, occupancy gains, lighting and equipment), infiltration and ventilation rates as well as pipework and heat interface unit's (HIU) losses (as provided by the MEP consultants).

Table 8: Summary of TM59 modelling inputs

Design Criteria	Living	Kitchen	Bedroom	Communal Corridors
Occupancy	2 People (2 Bed) 1 Person (1 Bed)	2 People (2 Bed) 1 Person (1 Bed)	2 People (2 Bed) 1 Person (1 Bed)	-
Profile	9:00 – 22:00	9:00 – 22:00	24/7	24/7
		Gai	ns	
Lighting	2 W/m ² (18:00-23:00)	2 W/m ² (18:00-23:00)	2 W/m ² (18:00-23:00)	2 W/m ²
Equipment	150W (peak load) 35W (base load)	300W (peak load) 50W (base load)	80W (peak load) 10W (base load)	-
Occupants (sensible)	75 W/person	75 W/person	75 W/person	-
Occupants (latent)	55 W/person	55 W/person	55 W/person	-
		Air cha	inges	
Infiltration	0.15 ACH	0.15 ACH	0.15 ACH	0.15 ACH
Ventilation supply rate	7.5 l/s/person	-	6 l/s/person	-
	Heat losses			
Pipework losses	7.5W/m			
HIU losses	2.5W (based on 0.06kWh/day)			

The following table demonstrates that none of the areas assessed are predicted to exceed the CIBSE TM59 overheating criteria during non-heating-season using the "LWC DSY1 2020 high emissions, 50% scenario" weather file.



Table 9: TM59 results using DSY1 2020 weather file

Apartment/Room	Criterion A Percentage of hours	Achieved?	Criterion B Number of hours above 26°C	Achieved?
4F - 4.01 - Bed 1	0.1	Yes	29	Yes
4F - 4.01 - Bed 2	0.3	Yes	26	Yes
4F - 4.01 - Kitchen	0.4	Yes	N/A	N/A
4F - 4.01 - Living	0.3	Yes	N/A	N/A
4F - 4.02 - Bed	0.1	Yes	18	Yes
4F - 4.02 - Living/Kitchen	0	Yes	N/A	N/A
4F - 4.05 - Bed 1	0	Yes	20	Yes
4F - 4.05 - Bed 2	0	Yes	13	Yes
4F - 4.05 - Living/Kitchen	0	Yes	N/A	N/A
5F - 5.01 - Bed	0.1	Yes	24	Yes
5F - 5.01 - Kitchen	0.1	Yes	N/A	N/A
5F - 5.01 - Living/Dining	0.2	Yes	N/A	N/A
5F - 5.03 - Bed 1	0.1	Yes	30	Yes
5F - 5.03 - Bed 2	0	Yes	19	Yes
5F - 5.03 - Living/Kitchen	0	Yes	N/A	N/A

Zone	Percentage of annual hours above 28°C	Achieved?
4F - Communal corridor	2	Yes
5F - Communal corridor	2.2	Yes

In addition, DSY2 and DSY3 and several future weather files have been assessed for the development, all achieving similar results. Only Criterion A of TM59 has been met with other criteria failing compliance as illustrated be seen in the following tables.

The results of these assessments will be further investigated during the next RIBA stages to inform the design development process and to mitigate any potential overheating risks where possible.

Table 10: TM59 results using DSY2 2020 weather file

Apartment/Room	Criterion A Percentage of hours	Achieved?	Criterion B Number of hours above 26°C	Achieved?
4F - 4.01 - Bed 1	0.7	Yes	68	No
4F - 4.01 - Bed 2	1.2	Yes	58	No
4F - 4.01 - Kitchen	1.7	Yes	N/A	N/A
4F - 4.01 - Living	1.6	Yes	N/A	N/A
4F - 4.02 - Bed	0.9	Yes	46	No
4F - 4.02 - Living/Kitchen	0.8	Yes	N/A	N/A
4F - 4.05 - Bed 1	0.1	Yes	60	No
4F - 4.05 - Bed 2	0	Yes	50	No
4F - 4.05 - Living/Kitchen	0.1	Yes	N/A	N/A



5F - 5.01 - Bed	0.7	Yes	61	No
5F - 5.01 - Kitchen	0.7	Yes	N/A	N/A
5F - 5.01 - Living/Dining	0.9	Yes	N/A	N/A
5F - 5.03 - Bed 1	0.9	Yes	69	No
5F - 5.03 - Bed 2	0.8	Yes	54	No
5F - 5.03 - Living/Kitchen	1.1	Yes	N/A	N/A

Zone	Percentage of annual hours Top>28	Achieved?
4F - Communal corridor	3.3	No
5F - Communal corridor	3.2	No

Table 11: TM59 results using DSY3 2020 weather file

Apartment/Room	Criterion A Percentage of hours	Achieved?	Criterion B Number of hours above 26°C	Achieved?
4F - 4.01 - Bed 1	1.1	Yes	73	No
4F - 4.01 - Bed 2	1.6	Yes	57	No
4F - 4.01 - Kitchen	2.1	Yes	N/A	N/A
4F - 4.01 - Living	2.1	Yes	N/A	N/A
4F - 4.02 - Bed	1.1	Yes	45	No
4F - 4.02 - Living/Kitchen	1.3	Yes	N/A	N/A
4F - 4.05 - Bed 1	0	Yes	62	No
4F - 4.05 - Bed 2	0	Yes	40	No
4F - 4.05 - Living/Kitchen	0	Yes	N/A	N/A
5F - 5.01 - Bed	1.1	Yes	66	No
5F - 5.01 - Kitchen	1.1	Yes	N/A	N/A
5F - 5.01 - Living/Dining	1.5	Yes	N/A	N/A
5F - 5.03 - Bed 1	1.2	Yes	69	No
5F - 5.03 - Bed 2	1.1	Yes	56	No
5F - 5.03 - Living/Kitchen	2	Yes	N/A	N/A

Zone	Percentage of annual hours Top>28	Achieved?
4F - Communal corridor	4.9	No
5F - Communal corridor	5.4	No



5.5 Proposed "Be Lean" stage

The regulated energy consumption and associated CO_2 emissions of the Proposed Development have been estimated using SAP 2012 for residential and Dynamic Simulation Modelling (DSM) software IES Virtual Environment (VE) 2019 following the National Calculation Method (NCM) for non-domestic element of the development.

The resulting CO₂ savings for the energy efficient "Be Lean" stage of the hierarchy are detailed in the table below:

Table 12: Estimated site-wide regulated CO₂ emissions and energy savings after Be Lean stage

	CO ₂ Emissions			
"BE LEAN"	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)		
Baseline	29.4	15.9		
Be Lean	27.3	15.9		
Regulated CO ₂ emissions savings	Tonnes CO ₂ per annum	%		
Be Lean: Savings from energy demand reduction	2.1	7.3%		

The above table demonstrates that a site-wide 7.3% reduction in regulated CO₂ emissions can be achieved for the development, with 5.2% and 18.9% achieved respectively for domestic and non-domestic elements.



6.0 Be Clean - Low Carbon Technology Appraisal

6.1 Introduction to technologies



This section considers the potential for connection to any existing or proposed DH network in the proximity of the site, and the feasibility of incorporating a CHP/Combined Cooling Heat and Power (CCHP) plant on-site.

CHP technology effectively uses waste heat from the electricity generation process to provide useful heat for space and water heating; the advantage of this system is that it leads to higher system efficiencies when compared to a typical supply arrangement of grid-imported electricity and conventional gas boilers. CHP is considered a low carbon technology when fired by natural gas to generate electricity and provide heating and hot water.

Whilst CHP technologies simultaneously produce heat and power (electricity), tri-generation (i.e. CCHP) implies the simultaneous production of power, heat and cooling from a single fuel.

A District Heating network (DH Network) is a system for distributing heat generated in a centralised location. The energy centre serving the area often includes a CHP plant. A DH network with CHP is considered a cost-effective way of cutting CO₂ emissions, and currently has one of the lowest CO₂ footprints of all fossil fuel generation plants. DH networks are prioritised by some regional and local planning authorities.

6.2 Applicability to the Proposed Development

The London Heat Map has been consulted in order to identify existing and potential future district energy network connection opportunities within a 1 km radius of the site.



Figure 5: London Heat Map



As depicted in Figure 5 above, the map indicates there is currently no existing network within immediate reach of the site. Future heat network has been identified within more than 500m from the Proposed Development, which does not offer a connection opportunity when it becomes available.

Due to the lack of existing district heating network in the vicinity, and the likelihood that any new system would take several years before it becomes available for connection, we believe it would be unreasonable to suggest the allowances for future connection to a heat network.

Responding to decarbonisation of the UK electrical grid with the aim to reduce environmental impact the Proposed Development has been designed to be 100% electrically powered. At present, the proposal is to use a communal high-efficiency air source heat pump system to meet heating and DHW needs of the Proposed Development.

On-Site CHP Opportunities

A CHP requires predictable and relatively constant loads for the best performance, as well as an adequate plant area for the associated equipment. Due to building's intended commercial use it is considered to present a sufficient baseline heating load for a CHP to operate effectively. Several other limitations have been identified which make an on-site CHP option not appropriate for Tottenham Mews development:

- A gas-fired CHP in the running 24/7 would generate significant emissions on site which could potentially have an adverse impact on air quality; and
- The National Grid in the UK is decarbonising rapidly and electrification becomes the most effective solution for carbon reduction strategies, while CHP cease to be a carbon-saving option for many projects.

Combined Cooling, Heat & Power Technology

A Combined Cooling, Heat & Power (CCHP) system is a CHP system with the inclusion of absorption chillers (i.e. chillers driven by heat) to provide space cooling from the CHP waste heat recovery system. This can allow the CHP system to function effectively through the summer period when space heating requirements are low. In addition to considerations listed above, absorption chillers require extensive heat rejection and can significantly increase capital and operational costs compared to a CHP system.

Requirements under the emerging Draft New London Plan (Policy SI3)

Adhering to the requirements within the emerging Draft New London Plan (Policy SI3), as a Major Development within a Heat Network Priority Area, it is required that the following technologies stated in the heating hierarchy are considered:

- a) connect to local existing or planned heat networks as identified above there is no existing or proposed heat networks in close vicinity of the site.
- b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required) no locally available secondary het sources were identified for the site. High efficiency central heating plant (heat pump) is proposed for the development offering opportunities to further reduce carbon emissions through decarbonisation of the grid.
- c) 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) as identified above the CHP option is not considered to be feasible for the development. Due to continuing decarbonisation of the electrical grid communal heat pump solution offers greater carbon savings for the development.
- d) use ultra-low NOx gas boilers all heating and hot water for the building is supplied by electrically powered non-combustion system, as such it is assumed there will be no NOx emissions associated with heating at the Proposed Development.



6.3 Proposed 'Be Clean' stage

Based on the feasibility analysis described previously none of the 'Be Clean' opportunities were found to be feasible or viable for the Proposed Development.

Table 13: Estimated regulated CO₂ emissions and savings after each stage of the energy hierarchy

	CO ₂ Emissions			
"BE CLEAN"	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)		
Baseline	29.4	15.9		
Be Lean	27.3	15.9		
Be Clean	27.3	15.9		
Regulated CO ₂ emissions savings	Tonnes CO ₂ per annum	%		
Be Lean: Savings from energy demand reduction	2.1	7.3%		
Be Clean: Savings from heat network	-	-		



7.0 Be Green – Renewable Energy Technologies

In line with the planning policies, consideration has been given to the inclusion of renewable energy technologies within the Proposed Development.

The renewable energy technologies, which have been found feasible for the Proposed Development and site-specific analysis for those technologies not considered feasible, are included in the following section.

In summary, the main site constraints are as follows:

- Location of the site in a dense urban environment with low average wind speed is constraining the opportunity for wind turbine installation.
- Location of the site in an urban area is limiting the possibilities of utilisation of biomass technologies.

In line with the objectives and the methodology outlined in the London Plan, a feasibility study of renewable energy technologies has been carried out for the Proposed Development. Overall, there are a number of constraints associated with the application site when considering the renewable technology provision. Please refer to Table 14 below.

The following table presents a summary of the technologies considered unsuitable for the site. The technologies have been considered as:

- H High feasibility: Technology is technically and economically feasible with few barriers to implementation.
- M Medium feasibility: Technology is technically and economically feasible, but there are barriers to implementation; and
- L Low feasibility: Technology is technically or economically unfeasible and has been discounted.



Table 14: Renewable technology feasibility

Technology	Feasibility		lity _	Comments		
	Н	M	Ĺ			
Ground Source Heat Pump (GSHP)		IM	_	GSHP technology exploits seasonal temperature differences between ground and air temperatures to provide heating in the winter and air conditioning in the summer.		
				GSHP systems use some electricity to run the heat pump, but as most of the energy for heating is taken from the ground, they produce less greenhouse gas than conventional heating systems.		
			>	Pipe work is placed either horizontally or vertically in the ground. Fluid pumped through the pipes takes up heat which is then extracted by the heat pump and released at a higher temperature to drive a space heating system.		
				A detailed geological survey, including test boreholes, would be required to verify the suitability of ground conditions and accurately estimate the potential capacity of the GSHP scheme.		
				Due to the nature of the project (building in a dense urban environment) there is no available ground space for incorporation of GSHP boreholes.		
				In addition, the fact that the study would potentially have to be extended beneath the main road and adjacent buildings, significantly increasing the risk, cost and the complexity of the scheme, makes GSHP technology not suitable for this site.		
2. Solar Hot Water (SHW) Systems				Active solar hot water technology uses the Sun's energy to heat fluid passing through a collector in an active process.		
			•	All available roof space has been allocated for 53no PV panels. An alternative renewable solution in the form of dedicated high efficiency heat pump is proposed for DHW provision.		



Technology	Feasibility		Feasibility		lity	Comments
	Н	M	L			
O Mind Dames				NATIONAL AND		

3. Wind Power



4. Biomass Heating



Micro wind turbines can be fitted to the roof of any selected building (given appropriate structural measures).

Mast-mounted wind turbines can be located in an open area away from obstructions such as buildings and tall trees.

A report by BRE¹ highlighted inherent problems and the poor performance to date of urban micro wind installations. Both technologies are considered marginally viable in-built environments by the majority of small wind turbine manufacturers due to the relatively low (and turbulent) wind speed prevailing in an urban environment. The RenSMART windspeed database estimates a predicted wind speed of around 5.6 m/s @ 25m above ground level at the location.

Hence, due to the configuration of the site, the character of the location, the lack of space and the relatively low wind speed in this built environment, the use of these technologies is not considered to be feasible.

Biomass boilers work on the principle that the combustion of wood chip or pellets can create heat for space heating and hot water loads.

There are several factors that strongly disadvantage this technology, namely:

- On-site fuel storage space requirements.
- The impact on local air quality (concerns exist over the level of NO₂ and particulate matter PM10 from biomass boiler installations, particularly in air quality management areas).
- Fuel sourcing and the cost of fuel.
- Traffic movement and access arrangements for regular fuel deliveries; and
- Regular ash removal and maintenance requirements.

Biomass boilers are therefore not further considered for the Proposed Development.

¹ Micro wind turbine in urban environments, Richard Phillips, Paul Blackmore, Jane Anderson, Michael Clift, Antonio Aguiló-Rullán and Steve Pester, BRE 2007 ISBN 978-1-84806-021-0.



Technology	Feasibility		lity	Comments
	Н	M	L	
5. Energy from Waste			•	Methane gas from sewage or waste can be captured and used for firing boilers. The Proposed Development will not generate sufficient waste to make this option worthwhile. Moreover, plant space requirements and emissions (air quality and odour) would be an issue. This option is therefore not considered feasible.

7.1 Preferred renewable technology – air source heat pumps

Heat pump systems have been improved in their efficiency over recent years - via the use of smart integrated controls, variable speed drives and potentially heat recovery - and now coefficient of performance (COP) in heating mode is realistic.

Air source heat pump system is considered a feasible technology for the Proposed Development to provide space heating and DHW to all occupied areas. Only heat pump system in heating mode is considered a renewable technology (The European Parliament and the Council of the European Union, 2009)².

Therefore, for the purposes of this report, only space heating and DHW energy associated with heat pumps will be included under the 'be green' stage, whilst any benefits associated with cooling mode have been included under the 'energy demand reduction or 'be lean' stage.

Advantages:

- High efficiency.
- Flexible operation and ease of installation (i.e. no requirement for gas supply, ventilation and flue arrangements and therefore the installation is straightforward).
- Lower associated carbon emissions due to the decarbonisation of the grid; and
- Low maintenance requirements.

Disadvantages:

- Capital cost for the system tends to be high; and
- Potential for refrigerant leaks.

Considerations:

The system can generate increased noise levels. An acoustic assessment may be necessary, particularly in dense urban areas.

² National Renewable Energy Action Plan for the United Kingdom - Article 4 of the Renewable Energy Directive 2009/28/EC.



7.2 Preferred renewable technology – photovoltaic panels (PV)

Photovoltaic Cells (PV) generate electricity from sunlight using semiconductor cells linked together to form a module. Electricity can still be generated in cloudy and overcast conditions, although more can be generated in direct sunlight.

The conditions that provide optimal generation in the UK are with South facing panels with a 30° elevation and no overshadowing.

The installation of a photovoltaic system is considered to be a viable option for this development as illustrated in Figure 6 below. The building has a significant roof area available for solar technologies which has been fully utilised by the proposed PV array. It consists of 53no 300Wp PV panels tilted at 30° and facing Southeast. The array is projected to generate around 13,093kWh annually.

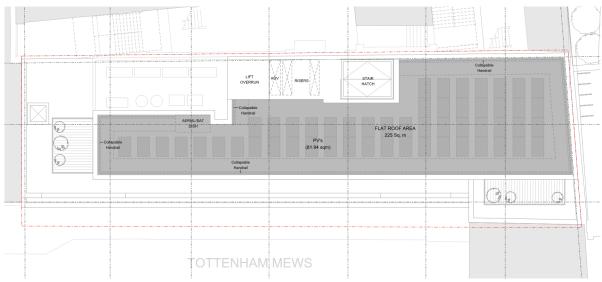


Figure 6: Indicative PV layout

Advantages:

- Maintenance requirement is low as panels are usually cleaned by rainwater, easily accessible and many products come with long guarantees.
- The technology has been in existence for a long time and is well understood.
- Easier and quicker to install compared to other LZC technologies.
- The technology is directly reducing electricity demand from the National Grid.

Disadvantages

- Any shading of panels can seriously impact the amount of electricity generated. Careful consideration should be given to the current and future levels of shading (e.g. account for services flue, adjacent buildings etc.).
- There may be spatial conflicts with other roof mounted equipment.



7.3 Proposed 'Be Green' stage

The 'Be Green' stage of the hierarchy includes the incorporation of heat pump and PV technologies.

The site-wide CO₂ emissions savings achievable through implementation of renewable energy technologies is **15.9** tonnes per annum, which corresponds to a **54%** reduction over the 'Be Lean' scheme, as illustrated in Table 15 below.

Table 15: Estimated regulated CO₂ emissions and savings after each stage of the energy hierarchy

	CO ₂ Emissions			
"BE GREEN"	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)		
Be Green	11.4	15.9		

Regulated CO ₂ emissions savings	Tonnes CO₂ per annum	%
Be Green: Savings from renewable energy	15.9	54%



8.0 Be Seen – Energy Monitoring

The emerging London Plan includes a new energy monitoring requirement referred to as "Be seen" in the Mayor's energy hierarchy to enable a better understanding of the actual operational energy performance of buildings and work towards bridging the 'performance gap' between their design and actual energy use.

This requires all major developments to monitor and report the actual operational energy performance of buildings for at least five years post construction using the reporting template and online portal.

The design team is committed to fulfil the 'Be seen' energy monitoring requirements for the Proposed Development during each stage outlined below.

Planning stage (no later than 4 weeks after planning consent)

- The necessary contextual and performance data will be uploaded to the 'Be seen' portal.
- The target dates for all subsequent 'Be seen' reporting stages will be confirmed.
- Confirmation of metering strategy and details that will enable the in-use energy performance reporting.

As-build stage (upon commencement of RIBA Stage 6)

- The contextual data will be updated accounting for any design changes and energy performance predictions for each reportable unit uploaded onto the 'be seen' portal.
- Confirmation that the metering installation is complete and correctly calibrated will be submitted.

Annual in-use reporting (for at least 5 years)

- Annual energy performance data to be submitted on annual basis in line with the GLA's requirements.
- Any deviations from estimated energy performance will be identified, quantified and potential mitigation measures will be proposed to improve the performance where possible.

8.1 Proposed metering strategy

To enable energy usage metering throughout the building meters will be installed on all main incoming feeds (electricity and water). Energy and water consumption for the development will be metered in accordance with statutory requirements, HQM requirements and industry best practices available on a centralised energy management system (EMS).

In summary the following metering strategy is adopted for the Proposed Development:

- 3 no. metered LV services from a new UKPN substation on Ground Floor split to feed residential, office and Landlord areas. Metering shall be centralised within the lower ground floor with all the residential meters in one room. Residential meters shall be Pay as you go smart meters with linked energy display units displaying energy usage information within each apartment. The office meter shall also be in the communal metering room.
- A new incoming main water service will be provided from Tottenham Mews to serve the building. A bulk water meter will be provided near the pipe entry point. Thames Water submeters, located together in a meter cupboard, along with provision for sprinkler riser and dry riser pipework.
- Electric consumer units within each apartment dwelling, with metering as required to meet the Registered Providers' Employer's Requirements. A dedicated distribution board with associated metering to be provided for the B1 office space.
- The building will circulate Low Temperature Hot Water (LTHW) throughout. Each apartment shall have a Heat Interface Unit (HIU), where this hot water is exchanged via plate heat exchangers to serve the



domestic hot water and space heating loads. This HIU will also provide each tenant metering and isolation of this service.

A Building Management System (BMS) will be installed to monitor and control landlord plant throughout the development.



Conclusion

The heating, DHW and electrical demands of the Proposed Development will be met, whilst at the same time energy consumption and associated CO₂ emissions to the atmosphere will be reduced, in accordance with the national, regional and local planning policy requirements and considering the site-specific necessities.

From the early design stage analysis, the following energy strategy has been identified for the Proposed Development:

- Specification of energy efficient and passive design measures, with associated site-wide savings in CO₂ emissions of **2.1** tonnes over the baseline building (regulated energy); and
- Renewable heat pump system providing space heating and DHW supplemented by a PV array achieve a further reduction in CO₂ emissions of circa **15.9** tonnes.

In total, this energy strategy will allow the Proposed Development to achieve up to **61.2**% reduction in regulated CO₂ emissions over the baseline, with energy efficiency measures providing **7.3**% reduction and the proposed LZC technologies contributing additional **54**% to the overall CO₂ emissions reduction.

As such, the Proposed Development will meet Draft London Plan aspirational site-wide targets for minimum carbon reduction as illustrated in Figure 7 below.

Table 16: Estimated regulated CO₂ emissions and savings after each stage of the hierarchy

Energy Hierarchy	CO ₂ Emissions (Residential)		CO ₂ Emissions (Non-residential))	
	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)	Regulated emissions (tCO ₂ /yr)	Unregulated emissions (tCO ₂ /yr)
Baseline	25.0	13.4	4.5	2.5
Be Lean	23.7	13.4	3.6	2.5
Be Clean	23.7	13.4	3.6	2.5
Be Green	8.1	13.4	3.4	2.5

Regulated CO₂ emissions savings	Residential		Non-residential	
	Tonnes CO ₂ per annum	%	Tonnes CO ₂ per annum	%
Be lean: Savings from energy demand reduction	1.3	5%	0.8	18.9%
Be clean: Savings from heat network	-	-	0.0	-
Be green: Savings from renewable energy	15.6	63%	0.3	6.1%
Total cumulative savings	16.9	68%	1.1	25.1%
Annual savings from off-set payment	8.1	-	3.4	-
Shortfall in Regulated CO ₂ savings	Tonnes CO ₂		Tonnes CO ₂	
Cumulative savings for off-set payment (over 30 years)	242	-	101	
Cash-in-lieu contribution (based on £95/tonne)	£22,973	-	£9,572	_



Table 17: Combined regulated CO2 emissions and savings

	Total regulated emissions (tCO ₂ / year)	CO ₂ savings (tCO ₂ / year)	Percentage savings (%)
Baseline	29.4	-	-
Be Lean	27.3	2.1	7.3%
Be Clean	27.3	-	-
Be Green	11.4	15.9	54%
Total savings	-	18	61.2%
Offset (tCO ₂)	-	345	-

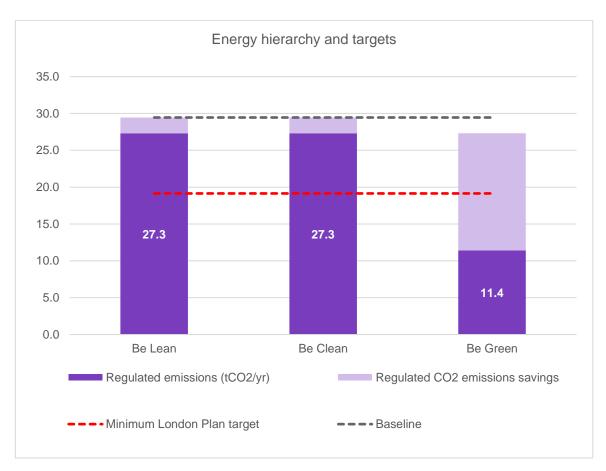


Figure 7: Estimated combined regulated CO₂ emission savings after each stage of the hierarchy

The potential CO₂ emissions savings achievable by the Proposed Development have been maximised through introduction of passive design and energy efficiency measures.

In addition, the application site's potential for installation of renewable technologies has been fully utilised by the design team and the improvements achieved by this energy strategy over the baseline are supportive of the objectives of the local and regional policy.

Please note that the energy efficiency and renewable energy features and associated specifications presented in this report will be subject to confirmation during next RIBA stages by the design team and the contractor. As a



result, these are presented for an indicative purpose at this stage and will need to be confirmed once the detailed design has been completed.

APPENDICES



APPENDIX A SAP REPORTS – "BE LEAN" STAGE

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:12

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:**

Flat

Total Floor Area: 85.3m²

Dwelling Details:

NEW DWELLING DESIGN STAGE

Plot Reference: Site Reference: **Tottenham Mews** 0_02 - 2B4P

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

18.5 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 18.26 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 48.0 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.19 (max. 0.30) 0.20 (max. 0.70) OK Floor 0.06 (max. 0.25) 0.06 (max. 0.70) OK Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: Cylinderstat OK

OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	ок
MVHR efficiency:	78%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	oK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	2.59m²	
Windows facing: North East	2.59m²	
Windows facing: North East	5m²	
Ventilation rate:	2.00	
Blinds/curtains:	Dark-coloured curtain or roller blind	1
	Closed 100% of daylight hours	
10 Key features		
Air permeablility	3.0 m³/m²h	<u>"</u>
Windows U-value	1.1 W/m²K	
Floors U-value	0.06 W/m ² K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.5.12	
	F	Property	Address	: 0_02 -	2B4P				
Address: 1. Overall dwelling dime	oneione:								
1. Overall dwelling diffie	511310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Ground floor				(1a) x		2.65	(2a) =	226.05	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	85.3	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	226.05	(5)
2. Ventilation rate:									
	main seconda heating heating	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	╗╻	0	Ī = Ī	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				0	x ²	10 =	0	(7a)
Number of passive vents	3			Ī	0	x ²	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_					
		_ 、	. _ \	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		, a to (_/ ,	00		o (o) to	(1.5)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	0.25 for steel or timber frame of the contract			•	ruction			0	(11)
deducting areas of openi		o irie grea	ter wall are	a (aner					
•	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	P x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15) (16)
	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) = ((16)				0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed		Г	
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (*	19)] =			0.7	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18					0.1	(21)
Infiltration rate modified f								<u> </u>	` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (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		
	• • •	-	-	-	-	-	-	•	

0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effec		-	rate for t	he appli	cable ca	se		ı	ı	ı		_	<u> </u>
If mechanical If exhaust air he			andiv N (2	3h) - (23a	a) v Emy (e	aguation (1	VSV) other	rwica (23h) = (232)			0.5	(2
If balanced with) = (23a)			0.5	(2
		-	-	_					2h\ (00h) [/	1 (00.0)	66.3	(2
a) If balance	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29) - 100]]	(2
b) If balance		l									0.23	J	(-
4b)m= 0	0		0	0	0	0	0	0	0	0	0	1	(2
c) If whole h												_	
if (22b)n				•	•				.5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from l	oft				J	
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	_	
5)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(
. Heat losse	c and he	nat loce r	aramata	or:								_	
	S and the Gros	•	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-valu	Δ	ΑΧk
LEMENT	area	_	m		A,r		W/m2		(W/I	K)	kJ/m².		kJ/K
indows Type	: 1				2.59	x1.	/[1/(1.1)+	0.04] =	2.73				(
indows Type	2				2.59	x1,	/[1/(1.1)+	0.04] =	2.73	Ħ			(
indows Type	3				5	x1	/[1/(1.1)+	0.04] =	5.27				(
oor					85.3	x	0.06	[5.118	=			(
alls Type1	35.	8	10.18	3	25.62		0.2	<u> </u>	5.12	=		-	`
alls Type2	45.		0			x				룩 ;			
otal area of e					45.1		0.19		8.35				
or windows and		•	offective wi	ndow I I-ve	166.2		r formula 1	/[/1/ ₋ val	(۱۸۵ مرامر	se aivon in	naragrani	h 3 2	(
include the area						atou using	i Torritula 1	/[(ic)+0.0+j c	is giveri iii	paragrapi	1 0.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				29.32	(
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	6397.5	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(
r design assess	ments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste						_							
ermal bridge	•	,			•	<						24.93	(
letails of therma Ital fabric he		are not kn	own (36) =	= <i>0.05 x (</i> 3	11)			(33) +	(36) =			54.05	(
entilation hea		alculator	l monthly	,					$= 0.33 \times ($	25\m v (5)	١	54.25	(
Jan	Feb	Mar			Jun	Jul	Aug	Sep	Oct	Nov	Ī _	1	
3)m= 22.56	22.36	22.16	Apr 21.18	May 20.99	20.01	20.01	19.81	20.4	20.99	21.38	21.77	1	(
· L		<u> </u>	21.10	20.33	20.01	20.01	13.01	<u> </u>	<u> </u>	<u> </u>	21.77	J	(
eat transfer o	coefficie	nt, W/K	1			1		· ` ′	= (37) + (37)		1	1	
9)m= 76.81	76.61	76.41	75.43	75.24	74.26	74.26	74.06	74.65	75.24	75.63	76.02		

Heat loss para	ameter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.9	0.9	0.9	0.88	0.88	0.87	0.87	0.87	0.88	0.88	0.89	0.89		
									Average =	Sum(40) ₁ .	12 /12=	0.88	(40)
Number of da	·	<u> </u>				l				T			
Jan 31	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)
4.144											1.3.50		
4. Water hea	iting ene	rgy requi	rement:								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.		56		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		4.9		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage							_	1 - 3 5		L			
(44)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		
										m(44) ₁₁₂ =	L	1138.8	(44)
Energy content o	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1			
(45)m= 154.81	135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		_
If instantaneous v	vater heati	na at point	of use (no	o hot water	· storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	• [1493.14	(45)
(46)m= 23.22	20.31	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(46)
Water storage		20.00	10.27	17.00	10.10	14.02	10.00	10.20	10.07	20.71	22.40		(10)
Storage volun	ne (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If community I	heating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufac		eclared l	nss fartí	nr is kna	wn (k\//h	n/day).					24		(48)
Temperature				51 15 Ki10	WII (ICVVI	ı, aay).					.6		(49)
Energy lost from				ear			(48) x (49)) =			34		(50)
b) If manufac		·			or is not		(10)11(10)	,		1.	J4		(00)
Hot water stor	_			le 2 (kW	h/litre/da	ay)					0		(51)
If community I Volume factor	_		on 4.3										(50)
Temperature 1			2b							—	0		(52) (53)
Energy lost from				≏ar			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,y	Jui			() ()	, (==, (,	-	34		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinder contain												хН	, ,
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circui	t loss for	nual) fra	m Table	3							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 loss calculat	ed for eacl	n month	(61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0	1	(61)
Total heat required	for water h	eating ca	alculated	l for eac	h month	(62)ı	<u>—</u> m =	0.85 × (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 219.73 194.		184.64	181.8	163.69	158.38	172		171.36	191.4	200.89	214.85]	(62)
Solar DHW input calcula	ed using Ap	pendix G o	r Appendix	H (negati	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	.)	
(add additional lines	if FGHRS	and/or \	WWHRS	applies	, see Ap	pend	lix G	3)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water h	eater		•		•						•	•	
(64)m= 219.73 194.	204.64	184.64	181.8	163.69	158.38	172	.17	171.36	191.4	200.89	214.85]	
	•				•		Outp	ut from wa	ater heate	er (annual) ₁	12	2257.6	(64)
Heat gains from wa	er heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	((46)m	+ (57)m	+ (59)m	ı]	
(65)m= 103.41 91.9	3 98.4	90.77	90.8	83.8	83.02	87.	.6	86.35	93.99	96.17	101.79]	(65)
include (57)m in o	alculation	of (65)m	only if c	ylinder i	s in the	dwell	ing (or hot w	ater is f	rom com	munity h	- neating	
5. Internal gains (see Table	5 and 5a):										
Metabolic gains (Ta	ble 5), Wa	tts											
Jan Fe		Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 127.79 127.	79 127.79	127.79	127.79	127.79	127.79	127	.79	127.79	127.79	127.79	127.79]	(66)
Lighting gains (calc	ulated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5				-	
(67)m= 23.21 20.6	2 16.77	12.69	9.49	8.01	8.66	11.2	25	15.1	19.17	22.38	23.86]	(67)
Appliances gains (c	alculated i	n Append	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 230.16 232.	55 226.53	213.72	197.54	182.34	172.19	169	9.8	175.82	188.63	204.8	220.01]	(68)
Cooking gains (cald	ulated in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5		•	•	
(69)m= 35.78 35.7	8 35.78	35.78	35.78	35.78	35.78	35.	78	35.78	35.78	35.78	35.78]	(69)
Pumps and fans ga	ns (Table	5a)			•							•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evapora	ition (nega	itive valu	es) (Tab	le 5)	-							-	
(71)m= -102.23 -102.	23 -102.23	-102.23	-102.23	-102.23	-102.23	-102	.23	-102.23	-102.23	-102.23	-102.23]	(71)
Water heating gains	(Table 5)				•		•					•	
(72)m= 139 136.	132.25	126.06	122.05	116.39	111.58	117.	.74	119.93	126.34	133.57	136.81]	(72)
Total internal gain	S =		•	(66)m + (67)m	n + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	•	
(73)m= 453.71 451.	31 436.89	413.81	390.41	368.08	353.76	360	.13	372.19	395.48	422.09	442.01]	(73)
6. Solar gains:													
Solar gains are calcula	•	ar flux from	Table 6a	and assoc	ciated equa	tions 1	to co	nvert to th	e applica		tion.		
Orientation: Acces		Area		Flu			т.	g_ able 6b	т	FF		Gains	
Table		m²		Ta	ble 6a			able ob	_ '	able 6c		(W)	,
	54 ×	2.5	59	X	11.28	X		0.44	x	8.0	=	5	(75)
	54 ×	2.5	59	X ·	11.28	X		0.44	x	0.8	=	5	(75)
	54 ×		5	X ·	11.28	X		0.44	x	0.8	=	9.65	(75)
	54 ×	2.5	59	x	22.97	X		0.44	x	0.8	=	10.18	(75)
Northeast 0.9x	54 ×	2.5	59	x	22.97	X		0.44	X	0.8	=	10.18	(75)

Northeast 0 36								_						
Northeast 0.0x	<u> </u>	0.54	X	5	X	2	2.97	X	0.44	X	0.8	=	19.64	(75)
Northeast 0.9x	<u> </u>	0.54	X	2.59	X	4	1.38	X	0.44	X	0.8	=	18.33	(75)
Northeast 0.ax	Northeast _{0.9x}	0.54	X	2.59	X	4	1.38	X	0.44	X	0.8	=	18.33	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	5	X	4	1.38	X	0.44	X	0.8	=	35.39	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	6	7.96	X	0.44	X	0.8	=	30.11	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	6	7.96	X	0.44	X	0.8	=	30.11	(75)
Northeast 0.8x	Northeast 0.9x	0.54	X	5	X	6	7.96	X	0.44	X	0.8	=	58.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	9	1.35	X	0.44	X	0.8	=	40.47	(75)
Northeast 0.9% 0.54	Northeast _{0.9x}	0.54	X	2.59	X	9	1.35	X	0.44	X	0.8	=	40.47	(75)
Northeast 0.9x	Northeast 0.9x	0.54	X	5	X	9	1.35	X	0.44	X	0.8	=	78.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	9	7.38	X	0.44	X	0.8	=	43.15	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	9	7.38	X	0.44	X	0.8	=	43.15	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	5	X	9	7.38	X	0.44	X	0.8	=	83.3	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x		91.1	X	0.44	x	0.8	_ =	40.36	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x		91.1	X	0.44	x	0.8	=	40.36	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x		91.1	X	0.44	x	0.8	=	77.92	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	7	2.63	X	0.44	x	0.8	=	32.18	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	x	7	2.63	X	0.44	x	0.8	=	32.18	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x	7	2.63	j x	0.44	x	0.8	=	62.12	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	x	5	0.42	X	0.44	X	0.8	=	22.34	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	5	0.42	X	0.44	x	0.8	=	22.34	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x	5	0.42	X	0.44	x	0.8	=	43.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	х	2.59	x	2	28.07	X	0.44	x	0.8	=	12.44	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	2	28.07	X	0.44	x	0.8	=	12.44	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x	2	28.07	X	0.44	x	0.8	=	24.01	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x		14.2	X	0.44	x	0.8	=	6.29	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	х	2.59	x		14.2	X	0.44	x	0.8	=	6.29	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x		14.2	X	0.44	x	0.8	=	12.14	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	,	9.21	X	0.44	x	0.8	=	4.08	(75)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 19.65	Northeast 0.9x	0.54	x	2.59	x	,	9.21	X	0.44	x	0.8	=	4.08	(75)
(83)m= 19.65 40 72.06 118.35 159.08 169.6 158.65 126.48 87.81 48.88 24.72 16.05 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Northeast _{0.9x}	0.54	x	5	x		9.21	j x	0.44	x	0.8	=	7.88	(75)
(83)m= 19.65 40 72.06 118.35 159.08 169.6 158.65 126.48 87.81 48.88 24.72 16.05 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_							_						
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in v	watts, cal	culated	for each m	onth			(83)m	n = Sum(74)m	(82)m			_	
(84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(83)m= 19.65	40	72.06	118.35 15	9.08	169.6	158.65	126	.48 87.81	48.88	3 24.72	16.05		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Total gains – ir	nternal ar	nd solar	(84)m = (73)	3)m + (83)m	, watts							
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 473.35	491.3	508.95	532.16 54	9.5	37.67	512.41	486	.61 459.99	444.3	6 446.81	458.06		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean interr	nal tempe	erature ((heating sea	ason)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during he	eating pe	eriods in the	e living	area	from Tal	ble 9	, Th1 (°C)				21	(85)
(86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation fact	tor for ga	ins for li	iving area, I	n1,m (s	ee Ta	ble 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Jan	Feb	Mar	Apr N	/lay	Jun	Jul	A	ug Sep	Oc	Nov	Dec		
	(86)m= 0.97	0.96	0.95	0.91 0.	84	0.71	0.57	0.6	0.8	0.92	0.96	0.97		(86)
	Mean internal	tempera	ture in I	iving area 1	1 (follo	ow ste	ps 3 to 7	7 in T	able 9c)					
			- 1		<u> </u>		i	_		20.13	3 19.56	19.09]	(87)
				•				•	•	•	•	-	•	

Temperature du	uring heating	oeriods ir	n rest of	dwellina	from Ta	ıble 9. T	h2 (°C)					
·	20.17 20.17	20.18	20.18	20.19	20.19	20.19	20.19	20.18	20.18	20.17		(88)
Utilisation factor	r for gains for	rest of d	welling, l	h2,m (se	ee Table	9a)				<u>!</u>		
	0.96 0.94	0.9	0.81	0.65	0.49	0.53	0.75	0.9	0.95	0.97		(89)
Mean internal to	emperature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m= 17.61	17.82 18.27	18.92	19.53	19.97	20.13	20.11	19.82	19.1	18.27	17.58		(90)
							f	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean internal te	emperature (f	or the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 18.34	18.52 18.9	19.45	19.98	20.37	20.52	20.5	20.23	19.6	18.9	18.31		(92)
Apply adjustme	nt to the mea	n interna	temper	ature fro	m Table	4e, whe	re appro	opriate				
(93)m= 18.34	18.52 18.9	19.45	19.98	20.37	20.52	20.5	20.23	19.6	18.9	18.31		(93)
8. Space heatin	ig requiremen	t										
Set Ti to the me the utilisation fa				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 factor	<u> </u>	<u> </u>	IVIQY	Odii	<u> </u>		СОР		1101			
	0.94 0.93	0.88	0.8	0.67	0.52	0.56	0.76	0.89	0.94	0.96		(94)
Useful gains, hr	mGm , W = (9	4)m x (8	4)m									
(95)m= 451.14 4	64.13 470.9	469.35	440.24	358.09	267.2	273.17	347.33	394.06	418.85	438.33		(95)
Monthly averag	e external ter	nperature	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)
					-``	-``	<u> </u>	-				4
(97)m= 1078.62 10										1073.05		(97)
·	<u> </u>	1								472.22		
(96)111= 400.04 3	354.65	235.3	133.63	U	U			<u> </u>		L	2606.25	7(08)
0		. 1 1 1 1 1	N			TOLA	i per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡```
	·										30.56	(99)
							المالة عالي					
									unity scr	neme.	0	(301)
Fraction of space	e heat from co	mmunity	system	1 – (30	1) =						1	(302)
•		_	-			allows for	CHP and ı	up to four o	other heat	sources: tl	he latter	
	-							ap to rour t	ouror riout		.o .ao.	
Fraction of heat f	from Commur	nity boiler	'S								1	(303a)
Fraction of total	mGm , W = (94)m x (84)m 464.13											
Factor for contro	r mean internal temperature, Lm , W = [(39)m x [(93)m – (96)m] 43.54 447.58 796.15 522.84 428.41 290.91 303.5 457.61 677.5 892.78 1073.05 692.48 428.41 290.91 303.5 457.61 677.5 892.78 1073.05 692.48 428.41 290.91 303.5 457.61 677.5 892.78 1073.05 692.48 428.41 290.91 303.5 457.61 677.5 892.78 1073.05 692.48 428.41 290.91 303.5 457.61 677.5 892.78 1073.05 692.48 428.41 290.91 303.5 457.61 677.5 892.78 1073.05 692.48 472.23 693.61 6											
Distribution loss	factor (Table	or space heating, space cooling or water heating provided by a community scheme. heat from secondary/supplementary heating (Table 11) '0' if none heat from community system 1 – (301) = ne may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter coumps, geothermal and waste heat from power stations. See Appendix C. om Community boilers and charging method (Table 4c(3)) for community heating system and charging method (Table 4c(3)) for community h										
Space heating	d for space heating, space cooling or water heating provided by a community scheme. See heat from secondary/supplementary heating (Table 11) '0' if none see heat from community system 1 – (301) = see heat from community system 1 – (301) = see heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter set pumps, geothermal and waste heat from power stations. See Appendix C. from Community boilers space heat from Community boilers of and charging method (Table 4c(3)) for community heating system fractor (Table 12c) for community heating system 1.05 space heating requirement fractor (Table 12c) for community heating system 1.05 space heating requirement fractor (Table 12c) for community heating system 1.05 space heating requirement space heat from Community heating system 1.05 space heating requirement 1.05 space heatin											
	ating require	nent										
Space heat from	Community b	ooilers					(98) x (30	04a) x (305	5) x (306) =	=	2736.67	(307a)
Efficiency of seco	ondary/supple	ementary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	j	0	(308

Space heating requirement from secondary/supple	r heating al water heating requirement N from community scheme: heat from Community boilers (64) x (303a) x (305) x (306) = 2370.48 (310a) (310a) x (305) x (306) = 2370.48 (310a) (313) x (313) x (305) x (306) = 51.07 (313) (313) x (313) x (305) x (306) = 51.07 (313) (313) x (313) x (313) x (310a) x					
Water heating Annual water heating requirement	Neating It water heating requirement					
If DHW from community scheme: Water heat from Community boilers	r heating al water heating requirement W from community scheme: r heat from Community boilers (64) x (303a) x (305) x (306) = 2370.48 (310a) (310a)(307e) + (310a)(310e) = 51.07 (313) ricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e) = 51.07 (313) ricity for pumps and fans within dwelling (Table 4f): anical ventilation - balanced, extract or positive input from outside air heating system fans for solar water heating electricity for the above, kWh/year = (330a) + (330b) + (330g) = 165.46 (331) ry for lighting (calculated in Appendix L) Energy kWh/year Finessions - Community heating scheme Energy from other sources of space and water heating (not CHP) ricrom other sources of space and water heating (not CHP) ricrom other sources of space and water heating (not CHP) ricrom other source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel eassociated with heat source 1 ((307b)+(310b)] x 100 + (367b) x (202 associated with community systems (363)(366) + (368)(372) CO2 associated with space heating (secondary) associated with space heating (secondary) (309) x 0 = 0 (374) associated with space and water heating (373) + (374) + (375) = 1259.07 (376) associated with space and water heating (373) + (374) + (375) = 1259.07 (376) associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 85.88 (378) associated with electricity for lighting (332) + (4) = 155.68 (383) Iling CO2 Emission Rate (383) + (4) =					
Electricity used for heat distribution	Neating					
Cooling System Energy Efficiency Ratio	Neating Invater heating requirement 2257.6					
Space cooling (if there is a fixed cooling system, if	not enter 0)	= (107) ÷ (314)	=		0	(315)
	re heating ual water heating requirement two from community scheme: are heat from Community bollers are heat from Community bo					
warm air heating system fans	r heating al water heating requirement W from community scheme: r heat from Community bollers (64) x (303a) x (305) x (306) = 2370.48 (310a) (310a)(307e) + (310a)(310e) = 51.07 (313) ang System Energy Efficiency Ratio cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) ricity for pumps and fans within dwelling (Table 4f): anical ventilation - balanced, extract or positive input from outside air heating system fans for solar water heating electricity for the above, kWh/year = (330a) + (330b) + (330g) = 165.46 (331) ag for lighting (calculated in Appendix L) CO2 Emissions – Community heating scheme Energy kWh/year Finession factor kWh/year Finessions (CO2/kWh kg CO2/kWh kg CO2/kwh kg CO2/kwh kg CO2/kwh cococococococococococococococococococo					
pump for solar water heating	ref heating ual water heating requirement					
Total electricity for the above, kWh/year	re heating ual water heating requirement #W from community scheme: er heat from Community bollers er heat from Community bollers er heat from Community bollers #W from community bollers er heat from Community bollers ##W from community bollers ##W from community bollers ###W from community bollers ###W from community bollers ### (64) x (303a) x (305) x (306) =					
Energy for lighting (calculated in Appendix L)	Neating water heating requirement 2257.6					
12h CO2 Emissions Community hosting schom	3					
12b. CO2 Emissions – Community heating scheme	5					
120. CO2 Emissions – Community heating scheme	En					
CO2 from other sources of space and water heating	r heating al water heating requirement N from community scheme: heat from Community boilers (64) x (303a) x (305) x (306) = 2370.48 (310a) (310a)(307e) + (310a)(310e) = 51.07 (313) (313) (315) g System Energy Efficiency Ratio (316) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (315) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (316) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (316) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (316) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (316) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (316) g Cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) (316) g Cooling (if there is a fixed cooling system fans or (330a) = (330a) (330a) g Cooling (if there is a fixed cooling system fans or (330a) = (330a) (330a) g Cooling (if there is a fixed cooling system fans or (330a) = (330a) + (330b) + (330g) = (330a) (330a) g Cooling (if there is a fixed cooling system fans or (330a) + (330b) + (330g) = (330a) + (330g) = (330a) (330a) g Cooling (if there is a fixed cooling system fans (331a) x (331a) x (331a) (331a) g Cooling (if there is a fixed cooling system fans (311a) x (321a) x (321a) x (321a) x (321a) (331a) g Cooling (if there is a fixed cooling system fans (311a) x (321a) x (321					
CO2 from other sources of space and water heating	Neating Water heating requirement 2257.6 Water heating requirement 2257.6 Water heating requirement 2257.6 Water heating requirement Water heating requirement Water heating requirement Water heating (and CHP) Water heat distribution 0.01 × ((307a) (307a) + (310a) (306b) = 2370.48 (310a) (313) Garage Gara					
CO2 from other sources of space and water heatin Efficiency of heat source 1 (%)	re heating ual water heating requirement #W from community scheme: er heat from Community bollers er heat from Community bollers er heat from Community bollers #W from community bollers er heat from Community bollers ##W from community bollers ##W from community bollers ###W from community bollers ###W from community bollers ### (64) x (303a) x (305) x (306) =					
CO2 from other sources of space and water heatin Efficiency of heat source 1 (%) CO2 associated with heat source 1	re heating ual water heating requirement #W from community scheme: er heat from Community bollers er heat from Community bollers er heat from Community bollers #W from community bollers er heat from Community bollers ##W from community bollers ##W from community bollers ###W from community bollers ###W from community bollers ### (64) x (303a) x (305) x (306) =					
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Theating All water heating requirement					
CO2 from other sources of space and water heatin 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)	Inform community scheme: Interest from Community boilers (64) x (303a) x (305) x (306) = (2370.48 (310a) Ity used for heat distribution (314) System Energy Efficiency Ratio (315) System Energy Efficiency Ratio (314) System Energy Efficiency Ratio (315) System Energy Efficiency Ratio (316) System Energy Efficiency Ratio (316) System Energy Efficiency Ratio (300a) Sys					
CO2 from other sources of space and water heatin 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)	Cooling (if there is a fixed cooling system, if not enter 0)					
CO2 from other sources of space and water heating 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 Total CO2 associated with space and water heating	city for pumps and fans within dwelling (Table 4f): Inical ventilation - balanced, extract or positive input from outside air heating system fans for solar water heating plectricity for the above, kWh/year for lighting (calculated in Appendix L) CO2 Emissions - Community heating scheme Energy kWh/year Emission factor kg CO2/kWh kg CO2/year					
CO2 from other sources of space and water heating 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 Total CO2 associated with space and water heating	air heating system fans for solar water heating for lighting (calculated in Appendix L) Aug.					
CO2 from other sources of space and water heating 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 Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fanse CO2 associated with electricity for lighting	En kW and (not CHP) Here is CHP using two fuel [(307b)+(310b)] x [(313) x (363)(3 (309) x or instantaneous here g (373) + (3 s within dwelling (33- (332))) x	/h/year s repeat (363) to 100 ÷ (367b) x 666) + (368)(372 ater (312) x 874) + (375) =	kg CO2/kWh (366) for the second 0.22 0.52 0 0.52	kg d fuel	89.5 1232.56 26.51 1259.07 0 1259.07 85.88 212.74	(367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating 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 Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fanse CO2 associated with electricity for lighting Total CO2, kg/year sum of (376)	Energy kWh/year look of space and water heating (not CHP) by of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel source 1 (367) is cociated with heat source 1 (370b) (3					

		l lser-I	Details:						
Assessor Name:	Vitaliy Troyan	USGI^L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	į	Property	Address	: 0_02 -	2B4P				
Address: 1. Overall dwelling dime	pnoiono:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	eight(m)		Volume(m	³)
Ground floor				(1a) x		2.65	(2a) =	226.05	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	85.3	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	226.05	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	-	0	Ī = Ī	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				3	x ′	10 =	30	(7a)
Number of passive vents	3			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_					
				_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue f	30		÷ (5) =	0.13	(8)
Number of storeys in t		ou to (11),	ouror wide t	oonanao n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openi	resent, use the value corresponding t ngs); if equal user 0.35	o trie grea	ter wall are	ea (anter					
•	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2) v (14) · 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es ner h					area	5	(16)
,	lity value, then $(18) = [(17) \div 20] +$	•	•	•	10110 01 0	лтоюро	uiou	0.38	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			`
Number of sides sheltered	ed		(00) 4	50 0 7 5 (4	40)1			4	(19)
Shelter factor	ting abolton footon		(20) = 1 -		19)] =			0.7	(20)
Infiltration rate incorpora			(21) = (18) X (20) =				0.27	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		1 00	1 7.59	T COP		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]	
Wind Foster (00s) : (2	2)		•	•	•	•		•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1 1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32	<u> </u>	1.00	1.14	1.10	J	

0.34 Calculate effect If mechanica	0.33 ctive air	0.33	0.29	0.29	0.25								
		change i	ate for t	he appli		0.25 se	0.25	0.27	0.29	0.3	0.31]	
	al ventila	tion:										0	
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , other	wise (23b) = (23a)			0	
If balanced with	heat reco	very: effici	ency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				0	
a) If balance	d mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [1 – (23c)) ÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	
b) If balance					ı		- ^ `	<u> </u>			1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		
c) If whole h				•	•				E (22h	.\			
if (22b)n 24c)m= 0	0.5 x	0	0) = (23L 0	0	0	0 = (220)	0	0 × (230	0	0	1	
d) If natural	_			,					<u> </u>			J	
if (22b)n									0.5]				
24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	
Effective air	change	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				-	
25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	
3. Heat losse	s and he	at loss r	naramete	or.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	е	ΑXk
	area	(m²)	m		A ,n		W/m2		(W/ł	<)	kJ/m²-		kJ/K
Vindows Type	: 1				2.59	x1	/[1/(1.4)+	0.04] =	3.43				
Vindows Type	2				2.59	х1	/[1/(1.4)+	0.04] =	3.43				
Vindows Type	3				5	x1.	/[1/(1.4)+	0.04] =	6.63				
loor					85.3	X	0.13	= [11.089				
Valls Type1	35.8	3	10.18	3	25.62	<u>x</u>	0.18	= [4.61				
Valls Type2	45.1	1	0		45.1	х	0.18	= [8.12				
otal area of e	lements	, m²			166.2	2							
for windows and * include the area						ated using	formula 1.	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	h 3.2	
abric heat los	s, W/K =	= S (A x	U)	·			(26)(30)	+ (32) =				37.3	31
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	639	7.5
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		25	0
or design assess an be used inste				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge				using Ap	pendix k	<						8.3	1
details of therma	,	,		• .	•								<u> </u>
otal fabric he	at loss							(33) +	(36) =			45.6	62
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		
88)m= 41.65	41.48	41.31	40.54	40.39	39.71	39.71	39.59	39.97	40.39	40.69	40.99]	
laat transfar s	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
ieai iransiei c													

eat loss para	meter (H	HLP), W/	m²K		_	_		(40)m	= (39)m ÷	- (4)			
0)m= 1.02	1.02	1.02	1.01	1.01	1	1	1	1	1.01	1.01	1.02		
umber of day	s in mo	nth <i>(</i> Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.01	(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 ene	rgy 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.		56		(42
nnual averag educe the annua ot more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		4.9		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		_
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	<u></u>	1138.8	(4
5)m= 154.81	135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		
									Total = Su	m(45) ₁₁₂ =	=	1493.14	(4
instantaneous w									1	i			
6)m= 23.22 /ater storage	20.31 loss:	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(4
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
community h	_			-			' '						
therwise if no ater storage		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day):				1.	65		(4
, emperature fa					•	,					54		(4
nergy lost fro				ear			(48) x (49)) =			89		(5
) If manufact			-										
ot water stora community h	•			e 2 (KVV	h/litre/da	ay)					0		(5
olume factor	_		JII 4 .5								0		(5
emperature fa	actor fro	m Table	2b							—	0		(5
nergy lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(5
nter (50) or (54) in (5	55)	·							0.	89		(5
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(5
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 Appendix	кН	
7)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(5
rimary circuit	loss (ar	nnual) fro	m Table	<u></u>							0		(5
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
		23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(5

Combiless	o louloto d	for ooob	manth /	(64)m	(CO) + 2(SE (41)	١,,,,						
Combi loss of (61)m= 0	o la cuiated	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0	1	(61)
		<u> </u>								ļ] (59)m + (61)m	(01)
(62)m= 205.73		190.64	171.09	167.8	150.14	144.38	158.17	157.81	177.4	187.34	200.85	(39)111 + (61)111	(62)
Solar DHW inpu						<u> </u>				l		I	(02)
(add addition									i contribut	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	u water hea	ter				Į						ı	
(64)m= 205.73		190.64	171.09	167.8	150.14	144.38	158.17	157.81	177.4	187.34	200.85		
							Out	out from w	ater heate	r (annual)₁	12	2092.75	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	า] + 0.8 ว	k [(46)m	+ (57)m	+ (59)m	 .]	
(65)m= 92.21	1	87.2	79.93	79.6	72.96	71.82	76.4	75.51	82.79	85.33	90.59	Ī	(65)
include (57	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	ı ıeating	
5. Internal	<u> </u>			•	•						,	J. Company	
Metabolic ga	ins (Table	e 5), Wat	ts										
Jan	T '	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 127.7	9 127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 23.88	21.21	17.25	13.06	9.76	8.24	8.9	11.57	15.53	19.73	23.02	24.54		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		•	•	
(68)m= 230.1	6 232.55	226.53	213.72	197.54	182.34	172.19	169.8	175.82	188.63	204.8	220.01		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78		(69)
Pumps and f	ans gains	(Table 5	āa)					•		•		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)			•	•	•	•		
(71)m= -102.2	3 -102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23		(71)
Water heatin	g gains (1	rable 5)				•		•	•		•		
(72)m= 123.9	4 121.75	117.2	111.01	106.99	101.34	96.53	102.69	104.88	111.28	118.52	121.76		(72)
Total interna	al gains =				(66))m + (67)m	+ (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 442.3	2 439.85	425.31	402.12	378.63	356.26	341.95	348.4	360.57	383.97	410.68	430.65		(73)
6. Solar gai	ns:									•			
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		-	g_ 	_	FF		Gains	
	Table 6d		m²		l al	ble 6a	. <u> </u>	able 6b	_	able 6c		(W)	_
Northeast 0.9x	0.54	X	2.5	59	x 1	1.28	x	0.63	x	0.7	=	6.26	(75)
Northeast 0.9x	0.54	X	2.5	59	x1	1.28	x	0.63	x	0.7	=	6.26	(75)
Northeast 0.9x	0.54	X	5		x 1	1.28	x	0.63	x [0.7	=	12.09	(75)
Northeast 0.9x		Х	2.5	59	x 2	22.97	x	0.63	x	0.7	=	12.75	(75)
Northeast 0.9x	0.54	X	2.5	59	x 2	22.97	X	0.63	x	0.7	=	12.75	(75)

_				_									
Northeast _{0.9x}	0.54	X	5	X	22.97	x		0.63	x	0.7	=	24.61	(75)
Northeast _{0.9x}	0.54	X	2.59	X	41.38	×		0.63	X	0.7	=	22.97	(75)
Northeast _{0.9x}	0.54	X	2.59	×	41.38	x		0.63	x	0.7	=	22.97	(75)
Northeast _{0.9x}	0.54	X	5	X	41.38	x		0.63	X	0.7	=	44.34	(75)
Northeast _{0.9x}	0.54	X	2.59	×	67.96	x		0.63	x [0.7	=	37.72	(75)
Northeast _{0.9x}	0.54	X	2.59	X	67.96	x		0.63	x [0.7	=	37.72	(75)
Northeast 0.9x	0.54	X	5	×	67.96	×		0.63	x [0.7	=	72.82	(75)
Northeast _{0.9x}	0.54	X	2.59	×	91.35	x		0.63	x [0.7	=	50.71	(75)
Northeast _{0.9x}	0.54	X	2.59	x	91.35	x		0.63	x [0.7	=	50.71	(75)
Northeast 0.9x	0.54	X	5	×	91.35	×		0.63	x [0.7	=	97.89	(75)
Northeast _{0.9x}	0.54	X	2.59	x	97.38	x		0.63	x [0.7	=	54.06	(75)
Northeast _{0.9x}	0.54	X	2.59	x	97.38	x		0.63	x [0.7	=	54.06	(75)
Northeast _{0.9x}	0.54	X	5	×	97.38	×		0.63	x [0.7	=	104.36	(75)
Northeast _{0.9x}	0.54	X	2.59	×	91.1	×		0.63	x [0.7	=	50.57	(75)
Northeast _{0.9x}	0.54	X	2.59	×	91.1	×		0.63	x [0.7	=	50.57	(75)
Northeast _{0.9x}	0.54	X	5	X	91.1	×		0.63	x	0.7	=	97.63	(75)
Northeast _{0.9x}	0.54	Х	2.59	×	72.63	x		0.63	x	0.7	=	40.32	(75)
Northeast _{0.9x}	0.54	X	2.59	×	72.63	×		0.63	x	0.7	=	40.32	(75)
Northeast _{0.9x}	0.54	X	5	x	72.63	x		0.63	x	0.7	=	77.83	(75)
Northeast _{0.9x}	0.54	Х	2.59	×	50.42	x		0.63	x	0.7	=	27.99	(75)
Northeast _{0.9x}	0.54	X	2.59	X	50.42	×		0.63	x	0.7	=	27.99	(75)
Northeast _{0.9x}	0.54	X	5	x	50.42	x		0.63	x	0.7	=	54.03	(75)
Northeast _{0.9x}	0.54	X	2.59	X	28.07	×		0.63	x	0.7	=	15.58	(75)
Northeast _{0.9x}	0.54	X	2.59	×	28.07	×		0.63	x [0.7	=	15.58	(75)
Northeast _{0.9x}	0.54	X	5	x	28.07	x		0.63	x	0.7	=	30.08	(75)
Northeast _{0.9x}	0.54	X	2.59	×	14.2	×		0.63	x [0.7	=	7.88	(75)
Northeast _{0.9x}	0.54	X	2.59	×	14.2	×		0.63	x [0.7	=	7.88	(75)
Northeast _{0.9x}	0.54	X	5	x	14.2	x		0.63	x [0.7	=	15.21	(75)
Northeast _{0.9x}	0.54	X	2.59	x	9.21	x		0.63	x [0.7	=	5.11	(75)
Northeast 0.9x	0.54	X	2.59	×	9.21	×		0.63	x [0.7	=	5.11	(75)
Northeast _{0.9x}	0.54	X	5	×	9.21	×		0.63	x [0.7	=	9.87	(75)
Solar gains in v								Sum(74)m .		_		1	
(83)m= 24.62	50.11	90.28	148.27 199		12.48 198.7		8.46	110.01	61.24	30.98	20.1		(83)
Total gains – in			` ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	`				1 470 50 1	445.04	1 444 05	450.75	Ī	(04)
(84)m= 466.94	489.96	515.6	550.39 577.		68.73 540.7	2 50	06.86	470.58	445.21	441.65	450.75		(84)
7. Mean interr			`										_
Temperature of	_			_			9, Tł	ո1 (°C)				21	(85)
Utilisation fact				Ť		i				1		Ī	
Jan	Feb	Mar		ay	Jun Jul	\rightarrow	Aug	Sep	Oct	Nov	Dec		(00)
(86)m= 1	1	1	0.99 0.9	!_	0.83 0.66	I).72	0.93	0.99	1	1		(86)
Mean internal		- 1		<u> </u>	i			 		1	ı	1	(0=)
(87)m= 19.88	19.97	20.16	20.44 20.7	72 2	20.92 20.98	8 2	0.97	20.83	20.49	20.14	19.87		(87)

_														
•							from Ta		· ` ´					(00)
(88)m=	20.06	20.07	20.07	20.07	20.08	20.08	20.08	20.08	20.08	20.08	20.07	20.07		(88)
	ation fac		i			· ` ·	e Table	9a)						
(89)m=	1	1	0.99	0.98	0.92	0.76	0.54	0.6	0.88	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.56	18.69	18.97	19.37	19.77	20.02	20.08	20.07	19.92	19.45	18.95	18.54		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.21	19.32	19.55	19.89	20.23	20.46	20.52	20.51	20.36	19.96	19.53	19.19		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.21	19.32	19.55	19.89	20.23	20.46	20.52	20.51	20.36	19.96	19.53	19.19		(93)
8. Spa	ace hea	ting requ	uirement											
			ternal ter or gains	•		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Juli	Jul	Aug	ССР	001	1107	Dec		
(94)m=	1	1	0.99	0.98	0.93	0.79	0.6	0.66	0.9	0.98	1	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m	l	l		l					
(95)m=	465.9	488.32	512.02	538.94	537.19	448.99	325.48	335.52	422.68	437.81	439.81	449.93		(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=	1301.08	1255.75	1134.4	947.2	733.84	499.94	334.38	350.28	536.07	804.95	1073.07	1298.34		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	621.38	515.71	463.05	293.95	146.31	0	0	0	0	273.16	455.95	631.22		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3400.72	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								39.87	(99)
9a. En	ergy rec	quiremer	nts – Ind	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_										1		_
	-		at from s			mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain 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)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	621.38	515.71	463.05	293.95	146.31	0	0	0	0	273.16	455.95	631.22		
(211)m	n = {[(98)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
	664.58	551.56	495.24	314.38	156.48	0	0	0	0	292.15	487.64	675.1		
			-			-	-	Tota	I (kWh/yea	ar) =Sum(2	211),15,1012	_	3637.13	(211)
•		•	econdar	• , .	month							'		
			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0 Tota	0	0	0	0		7(045)
								rota	ıl (kWh/yea	zi) ≓OUIII(2	- 10) _{15,1012}	_	0	(215)
01	-C A D OO4	2 \/araian	. 4 0 5 40	C A D A AA	http://wa								Dogo	^ -£ 7

Water heating								
Output from water heater (calculated above) 205.73 181.39 190.64 171.09 167.8 1	50.14 144.38	158.17	157.81	177.4	187.34	200.85]	
Efficiency of water heater		1		1	1		79.8	(216)
(217)m= 87.58 87.45 87.09 86.25 84.45	79.8 79.8	79.8	79.8	85.96	87.1	87.66		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•	•					•	
· / · · · · · · · · · · · · · · · · · ·	88.14 180.93	198.21	197.76	206.37	215.09	229.11		_
		Tota	I = Sum(2	19a) ₁₁₂ =			2473.92	(219)
Annual totals				k'	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1							3637.13	_
Water heating fuel used							2473.92	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2300
boiler with a fan-assisted flue						45		(230e
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							421.71	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHF						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	785.62	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	534.37	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1319.99	(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	=	218.87	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1577.78	(272)

TER =

(273)

18.5

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:11

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 91.6m2

2_01 - 3B5P Site Reference: **Tottenham Mews Plot Reference:**

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

15.53 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 15.11 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.5 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70) OK

Floor (no floor)

Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.61	
Maximum	1.5	ОК
MVHR efficiency:	79%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	3.29m ²	
Windows facing: North West	14.56m²	
Windows facing: South West	1.65m²	
Windows facing: South West	2.12m ²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller	r blind
	Closed 100% of daylight hour	S
40 1/ (- 4		
10 Key features		
Air permeablility	3.0 m ³ /m ² h	
Windows U-value	1.1 W/m²K	
Community heating, heat from boilers – mains gas		

User Details:	
Assessor Name: Vitaliy Troyan Stroma Number: STRO018096	
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.12	
Property Address: 2_01 - 3B5P	
Address: 1. Overall dwelling dimensions:	
Area(m²) Av. Height(m) Volume(m³)	
Ground floor 91.6 (1a) x 2.65 (2a) = 242.74 (3a)	a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 91.6 (4)	
Dwelling volume $ (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 242.74 $)
2. Ventilation rate:	
main secondary other total m³ per hour heating heating	
Number of chimneys $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$ (6b))
Number of intermittent fans $0 \times 10 = 0$ (7a)	a)
Number of passive vents $0 x 10 = 0 (7b)$	o)
Number of flueless gas fires $0 x 40 = 0 (7c)$:)
Air changes per hour	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	
Number of storeys in the dwelling (ns))
Additional infiltration $[(9)-1] \times 0.1 = 0 $ (10)))
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)	1)
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	2)
If no draught lobby, enter 0.05, else enter 0	3)
Percentage of windows and doors draught stripped 0 (14)	
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15) Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)	
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ O.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 4 (19)	∌)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.7$ (20)))
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.1$ (21)	1)
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	
(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		<u> </u>				` 	`	<u> </u>	0.44	0.40		1	
0.13 Calculate effec	0.13 Ctive air	0.13 Change i	0.12 ate for t	0.11 he appli	0.1 cable ca	0.1 S e	0.1	0.1	0.11	0.12	0.12		
If mechanica		•										0.5	(23
If exhaust air he	eat 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	ency in %	allowing f	or in-use f	actor (fron	Table 4h) =				67.15	(23
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29		(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	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				•	•				_ /	,			
if (22b)n		<u> </u>	,	, ,		· ·	ŕ	<u> </u>	· ` `			1	(2)
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n				•	•				0 51				
24d)m= 0	0	0	0	0	0	0	0.0 1 [(2	0	0.01	0	0]	(24
Effective air	change	rate - er	ter (24a	or (24h	o) or (24)	c) or (24	d) in box	(25)			ļ	J	
25)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29]	(25
											l	J	
3. Heat losse	_	·											
LEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	()	k-value kJ/m²-		X k J/K
Vindows Type		` ,			3.29		/[1/(1.1)+	0.04] =	3.47	,			(27
Vindows Type	2				3.64	x1	/[1/(1.1)+	0.04] =	3.84				(27
Vindows Type	3				1.65	x1,	/[1/(1.1)+	0.04] =	1.74	=			(27
Vindows Type					2.12	号 ,	/[1/(1.1)+	0.04] =	2.23	=			(27
Valls Type1	64.	1	21.62	,	42.48	=	0.2		8.5	=			(29
Valls Type2	12.3		0	=	12.2	=	0.19	╡┇	2.26	러 片		╡	(29
otal area of e	L				76.3	╡ ^	0.10		2.20				(31
for windows and		•	ffective wi	ndow U-va		 ated usind	formula 1	/[(1/U-valu	ie)+0.041 a	ns aiven in	paragrapl	1 3.2	(0)
* include the area						a to a a o		1(", 0 ' tall	,	.c g	paragrap.	. 0.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				33.53	(33
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass	parame	ter (TMF	? = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Low		100	(35
or design assess				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste Thermal bridge				ıcina Δr	nandiv k	(44.45	(36
details of therma	•	•		• .	•	`						11.45	(30
otal fabric he		are not an	own (00) -	- 0.00 X (0	1)			(33) +	(36) =			44.98	(37
entilation 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= 23.88	23.67	23.46	22.41	22.2	21.15	21.15	20.94	21.57	22.2	22.62	23.04	1	(38
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m	•		
	68.65	68.44	67.39	67.18	66.13	66.13	65.92	66.55	67.18	67.6	68.02]	
39)m= 68.86	00.00												

	meter (F	ILP), W/	m²K	,				(40)m	= (39)m ÷	- (4)			
)m= 0.75	0.75	0.75	0.74	0.73	0.72	0.72	0.72	0.73	0.73	0.74	0.74		_
ımber of day	re in mor	oth (Tabl	lo 1a)					,	Average =	Sum(40) ₁	12 /12=	0.74	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
							ļ	!	ļ	<u> </u>	<u> </u>		
. Water heat	ting ener	gy requi	rement:								kWh/ye	ar:	
sumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (⁻	TFA -13.		65		(4
nual averag duce the annua more that 125	al average	hot water	usage by	5% if the a	welling is	designed t			se target o		7.07		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	able 1c x	(43)			!	<u>. </u>		
)m= 106.77	102.89	99.01	95.12	91.24	87.36	87.36	91.24	95.12	99.01	102.89	106.77		
ergy content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd.n	n x nm x F.	OTm / 3600			m(44) ₁₁₂ =		1164.79	(-
m= 158.34	138.49	142.91	124.59	119.55	103.16	95.59	109.69	111	129.36	141.21	153.34		
			12.1100						l	m(45) ₁₁₂ =		1527.23	(
stantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)					
)m= 23.75	20.77	21.44	18.69	17.93	15.47	14.34	16.45	16.65	19.4	21.18	23		(
ater storage orage volum		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(
community h	,					ŭ					200		`
nerwise if no	_			_			, ,	ers) ente	er '0' in ((47)			
ater storage		المعاما	ft-	مسامات	/1-\^//-	/da./\							,
If manufact mperature fa				or is kno	wn (Kvvr	i/day):					24		(
ergy lost fro				ar			(48) x (49)) =			34		(
If manufact		_	-		or is not		(10) // (10)	,		1.	.54		(
t water stora	•			e 2 (kWl	h/litre/da	ıy)					0		(
community h	_		on 4.3										(
			2b								0		(
							(47) x (51)) x (52) x (53) =		0		
mperature fa	m water	storage	, kWh/ye	ear							-		(
mperature fa ergy lost fro		•	, kWh/ye	ear						1.	34		
mperature fa ergy lost fro nter (50) or ((54) in (5	55)					((56)m = ((55) × (41)	m	1.	34		
mperature fa ergy lost fro hter (50) or (ater storage	(54) in (5	55)			40.32		((56)m = (41.66	(55) × (41)	m 41.66	40.32	41.66		(
mperature fa ergy lost fro hter (50) or (hater storage m= 41.66	(54) in (5 loss cal	55) culated f	or each	month 41.66		41.66	41.66	40.32	41.66	40.32	41.66	κН	(
lume factor mperature factor ergy lost fro nter (50) or (ater storage)m= 41.66 ylinder contains)m= 41.66	(54) in (5 loss cal	55) culated f	or each	month 41.66		41.66	41.66	40.32	41.66	40.32	41.66	κН	(; (; (;
ergy lost fro ergy lost fro hter (50) or (ater storage)m= 41.66	(54) in (5 loss calc 37.63 s dedicated 37.63	culated f 41.66 d solar sto 41.66	40.32 rage, (57)1 40.32	month 41.66 m = (56)m 41.66	x [(50) – (41.66 H11)] ÷ (50	41.66 0), else (5	40.32 7)m = (56)	41.66 m where (40.32 H11) is fro	41.66 m Appendix	∢Н	((
ergy lost fro ergy lost fro ater (50) or (ater storage am= 41.66	37.63 s dedicated 37.63 loss (an loss cale	41.66 41.66 41.66 nual) froculated f	40.32 rage, (57) 40.32 om Table for each	month 41.66 m = (56)m 41.66 e 3 month (x [(50) - (40.32 59)m = (41.66 H11)] ÷ (50 41.66	41.66 0), else (5 41.66	40.32 7)m = (56) 40.32	41.66 m where (41.66	40.32 H11) is fro	41.66 om Appendix 41.66	∢Н	(

Combi loss calcu	ulated for e	each i	month (61)m =	(60) ÷	365 × (41)m							
(61)m= 0)	0	0	0	0	0	Т	0	0	0	0	1	(61)
Total heat require	ed for wate	er he	ating ca	alculated	l for ea	ach month	(62)r	n =	0.85 × (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
		_	187.42	184.47	165.9		174.	_	173.83	194.29	204.04	218.27]	(62)
Solar DHW input cald	culated using	Appe	ndix G or	Appendix	H (neg	ative quantit	y) (ente	er '0'	if no sola	r contribu	tion to wate	er heating)	.)	
(add additional li	nes if FGH	IRS a	and/or V	VWHRS	appli	es, see Ap	pend	ix G	i)					
(63)m= 0	0 ()	0	0	0	0	0		0	0	0	0]	(63)
Output from water	er heater	•				•					•	•	•	
(64)m= 223.27 1	97.13 207	7.83	187.42	184.47	165.9	9 160.52	174.	62	173.83	194.29	204.04	218.27]	
	•					•	(Outpu	ut from wa	ater heate	er (annual) ₁	12	2291.68	(64)
Heat gains from	water hea	ting, l	kWh/mo	onth 0.2	5 ′ [0.8	35 × (45)m	ı + (6	1)m]] + 0.8 x	((46)m	+ (57)m	+ (59)m	۱]	
(65)m= 104.59 9	92.96 99.	.46	91.69	91.69	84.57	7 83.73	88.4	11	87.17	94.95	97.22	102.93]	(65)
include (57)m	in calculat	ion o	f (65)m	only if c	ylinde	r is in the	dwelli	ng c	or hot w	ater is f	rom com	munity h	- neating	
5. Internal gain	s (see Tal	ole 5	and 5a)):										
Metabolic gains	(Table 5),	Watts	S											
Jan		1ar	Apr	May	Jur	n Jul	Αι	ıg	Sep	Oct	Nov	Dec]	
(66)m= 132.35 1	32.35 132	2.35	132.35	132.35	132.3	5 132.35	132.	35	132.35	132.35	132.35	132.35]	(66)
Lighting gains (c	alculated i	n App	pendix I	L, equat	ion L9	or L9a), a	lso se	ee T	able 5				-	
(67)m= 21.59	19.18 15.	.59	11.81	8.83	7.45	8.05	10.4	16	14.05	17.83	20.81	22.19]	(67)
Appliances gains	s (calculate	ed in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 241.99 2	244.5 238	3.17	224.7	207.7	191.7	1 181.04	178.	53	184.85	198.33	215.33	231.31]	(68)
Cooking gains (c	alculated	in Ap	pendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5			•	
(69)m= 36.23	36.23 36.	.23	36.23	36.23	36.23	36.23	36.2	23	36.23	36.23	36.23	36.23]	(69)
Pumps and fans	gains (Tal	ble 5	a)			•							•	
(70)m= 0	0 ()	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evap	oration (n	egati	ve valu	es) (Tab	le 5)	-					-		-	
(71)m= -105.88 -1	105.88 -105	5.88	-105.88	-105.88	-105.8	8 -105.88	-105.	.88	-105.88	-105.88	-105.88	-105.88]	(71)
Water heating ga	ains (Table	5)	-		-	-			,		-	-	-	
(72)m= 140.58 1	38.33 133	3.68	127.35	123.24	117.4	5 112.53	118.	84	121.07	127.63	135.02	138.34]	(72)
Total internal ga	ains =				(66)m + (67)n	า + (68)m +	(69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 466.86 4	164.72 450).15	426.56	402.47	379.3	2 364.33	370.	53	382.68	406.49	433.88	454.55]	(73)
6. Solar gains:														
Solar gains are cald	_		flux from	Table 6a		·	ations t	o cor	overt to th	e applica		tion.		
Orientation: Acc	cess Facto ble 6d	or	Area m²			lux able 6a			g_ able 6b	т	FF able 6c		Gains (W)	
		, ,			<u> </u>		, ,	1 6		, -				1
Southwest _{0.9x}	0.54	X	3.2	.9	x	36.79	ן וְ		0.44	_ ×	0.8	=	20.71	(79)
Southwest _{0.9x}	0.54	X	1.6	55	x	36.79	ַן וְ		0.44	x	0.8	=	10.39	(79)
Southwest _{0.9x}	0.54	X	2.1		× L	36.79	֡֓֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓		0.44	_ ×	8.0	=	13.34	(79)
Southwest _{0.9x}	0.54	X	3.2	.9	×	62.67	ļļ		0.44	×	8.0	=	35.27	(79)
Southwest _{0.9x}	0.54	X	1.6	5	X	62.67	J [0.44	X	0.8	=	17.69	(79)

Southwests o		7		1		1		l		1		7(70)
Southwest _{0.9x}	0.54	X	2.12	X	62.67] 1	0.44	X	0.8] = 1	22.73	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75	<u> </u>	0.44	X	0.8] =	48.26	(79)
Southwest _{0.9x}	0.54	X	1.65	X	85.75] i	0.44	X	0.8	=	24.21	(79)
Southwest _{0.9x}	0.54	X	2.12	X	85.75		0.44	X	0.8	=	31.1	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25		0.44	X	0.8	=	59.8	(79)
Southwest _{0.9x}	0.54	X	1.65	X	106.25		0.44	X	0.8] =	29.99	(79)
Southwest _{0.9x}	0.54	X	2.12	X	106.25		0.44	X	0.8	=	38.53	(79)
Southwest _{0.9x}	0.54	X	3.29	X	119.01		0.44	X	0.8	=	66.98	(79)
Southwest _{0.9x}	0.54	X	1.65	X	119.01		0.44	X	0.8	=	33.59	(79)
Southwest _{0.9x}	0.54	X	2.12	X	119.01	[0.44	X	0.8	=	43.16	(79)
Southwest _{0.9x}	0.54	X	3.29	X	118.15		0.44	X	0.8	=	66.5	(79)
Southwest _{0.9x}	0.54	X	1.65	X	118.15		0.44	X	0.8	=	33.35	(79)
Southwest _{0.9x}	0.54	X	2.12	X	118.15		0.44	X	0.8	=	42.85	(79)
Southwest _{0.9x}	0.54	X	3.29	X	113.91		0.44	X	0.8	=	64.11	(79)
Southwest _{0.9x}	0.54	X	1.65	X	113.91		0.44	X	0.8	=	32.15	(79)
Southwest _{0.9x}	0.54	X	2.12	X	113.91		0.44	X	0.8	=	41.31	(79)
Southwest _{0.9x}	0.54	X	3.29	X	104.39		0.44	X	0.8	=	58.75	(79)
Southwest _{0.9x}	0.54	X	1.65	X	104.39		0.44	x	0.8	=	29.47	(79)
Southwest _{0.9x}	0.54	X	2.12	X	104.39]	0.44	X	0.8	=	37.86	(79)
Southwest _{0.9x}	0.54	X	3.29	X	92.85		0.44	X	0.8	=	52.26	(79)
Southwest _{0.9x}	0.54	X	1.65	X	92.85		0.44	X	0.8	=	26.21	(79)
Southwest _{0.9x}	0.54	X	2.12	x	92.85		0.44	x	0.8	=	33.67	(79)
Southwest _{0.9x}	0.54	X	3.29	X	69.27		0.44	X	0.8	=	38.99	(79)
Southwest _{0.9x}	0.54	X	1.65	X	69.27		0.44	x	0.8	=	19.55	(79)
Southwest _{0.9x}	0.54	X	2.12	X	69.27		0.44	x	0.8	=	25.12	(79)
Southwest _{0.9x}	0.54	X	3.29	X	44.07		0.44	X	0.8	=	24.8	(79)
Southwest _{0.9x}	0.54	X	1.65	X	44.07		0.44	x	0.8	=	12.44	(79)
Southwest _{0.9x}	0.54	X	2.12	X	44.07		0.44	x	0.8	=	15.98	(79)
Southwest _{0.9x}	0.54	X	3.29	X	31.49		0.44	x	0.8	=	17.72	(79)
Southwest _{0.9x}	0.54	X	1.65	X	31.49		0.44	x	0.8	=	8.89	(79)
Southwest _{0.9x}	0.54	X	2.12	X	31.49		0.44	x	0.8	=	11.42	(79)
Northwest _{0.9x}	0.54	X	3.64	X	11.28	x	0.44	x	0.8	=	28.1	(81)
Northwest 0.9x	0.54	X	3.64	X	22.97	x	0.44	x	0.8	=	57.21	(81)
Northwest _{0.9x}	0.54	X	3.64	x	41.38	x	0.44	x	0.8	=	103.07	(81)
Northwest _{0.9x}	0.54	X	3.64	x	67.96	x	0.44	x	0.8	=	169.26	(81)
Northwest _{0.9x}	0.54	X	3.64	x	91.35	x	0.44	x	0.8	=	227.53	(81)
Northwest _{0.9x}	0.54	X	3.64	x	97.38	х	0.44	x	0.8	<u> </u>	242.57	(81)
Northwest _{0.9x}	0.54	x	3.64	x	91.1	x	0.44	x	0.8	j =	226.92	(81)
Northwest _{0.9x}	0.54	x	3.64	×	72.63	×	0.44	x	0.8] =	180.9	(81)
Northwest _{0.9x}	0.54	x	3.64	x	50.42	x	0.44	x	0.8	=	125.59	(81)
Northwest _{0.9x}	0.54	X	3.64	x	28.07	x	0.44	x	0.8	j =	69.91	(81)
		_		-		-		•		-		

Northwe	est _{0.9x}	0.54	х	3.6	64	х	14.2	х	0.44	x	0.8	=	35.36	(81)
Northwe	est _{0.9x}	0.54	x	3.6	64	x	9.21	x	0.44	_ x _	0.8	=	22.95	(81)
	_													
Solar g	ains in	watts, ca	alculated	for eacl	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	72.54	132.9	206.64	297.59	371.26	385.26	364.49	306.98	237.73	153.57	88.59	60.98		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	- (73)m -	+ (83)m	, watts	•	•				•	
(84)m=	539.4	597.62	656.79	724.15	773.73	764.59	728.82	677.51	620.41	560.06	522.46	515.53		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.94	0.9	0.82	0.69	0.52	0.39	0.43	0.65	0.86	0.94	0.97		(86)
Mean	interna	l temper	ature in I	iving are	ea T1 (fo	ollow ste	eps 3 to 7	in Tabl	e 9c)		•		·	
(87)m=	19.57	19.77	20.1	20.5	20.79	20.94	20.98	20.98	20.87	20.5	19.98	19.53		(87)
Tomp	oroturo	during h	LI	oriodo ir	root of	dwallin	trom To	hla O T	h2 (°C)		l			
(88)m=	20.3	20.3	20.3	20.31	20.31	20.32	g from Ta	20.32	20.32	20.31	20.31	20.3		(88)
			<u> </u>				<u> </u>	<u> </u>	20.02	20.01	20.01	20.0		(00)
I						· ·	ee Table	r	0.0	0.00	0.00	0.00	1	(89)
(89)m=	0.96	0.93	0.89	8.0	0.66	0.47	0.33	0.37	0.6	0.83	0.93	0.96		(69)
I			ature in t		of dwelli		follow ste	r i	7 in Tabl	e 9c)			l	
(90)m=	18.35	18.64	19.11	19.68	20.07	20.27	20.31	20.31	20.19	19.69	18.95	18.31		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.45	(91)
Mean														
	interna	l temper	ature (fo	r the wh	ole dwe	lling) = 1	LA × T1	+ (1 – fL	A) × T2					
(92)m=	interna 18.91	l temper 19.16	ature (fo 19.56	r the wh 20.05	ole dwe 20.4	lling) = 1 20.57	LA × T1	+ (1 – fL 20.61	A) × T2	20.06	19.42	18.86		(92)
	18.91 adjustn	19.16	19.56	20.05	20.4	20.57	1	20.61	20.5		19.42	18.86		(92)
Apply (93)m=	18.91 adjustn 18.91	19.16 nent to tl	19.56 he mean 19.56	20.05	20.4	20.57	20.62	20.61	20.5		19.42	18.86		(92) (93)
Apply (93)m=	18.91 adjustn 18.91 ace hea	19.16 nent to the 19.16 ting requ	19.56 he mean 19.56 uirement	20.05 internal 20.05	20.4 tempera 20.4	20.57 ature fro 20.57	20.62 om Table 20.62	20.61 4e, whe	20.5 ere appro 20.5	opriate 20.06	19.42	18.86		
Apply (93)m= 8. Spa	18.91 adjustn 18.91 ace hea	19.16 nent to the standard from 19.16 ting requirement into the standard from 19.16	19.56 he mean 19.56 uirement ernal ten	20.05 internal 20.05 nperatui	20.4 tempera 20.4 re obtain	20.57 ature fro 20.57	20.62 om Table	20.61 4e, whe	20.5 ere appro 20.5	opriate 20.06	19.42	18.86	culate	
Apply (93)m= 8. Spa	adjustn 18.91 ace hea to the r	19.16 nent to the second requirement interest factor for the second record reco	19.56 he mean 19.56 uirement ternal ten	20.05 internal 20.05 nperaturusing Ta	20.4 tempera 20.4 re obtain able 9a	20.57 ature fro	20.62 pm Table 20.62 rep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	opriate 20.06 t Ti,m=(19.42 76)m an	18.86 d re-cald	culate	
Apply (93)m= 8. Spa Set Ti the ut	adjustn 18.91 ace hea to the r ilisation Jan	19.16 nent to tl 19.16 ting requirement int factor for Feb	19.56 he mean 19.56 uirement ernal ten or gains t	20.05 internal 20.05 nperaturusing Ta	20.4 tempera 20.4 re obtain	20.57 ature fro 20.57	20.62 om Table 20.62	20.61 4e, whe	20.5 ere appro 20.5	opriate 20.06	19.42	18.86	culate	
Apply (93)m= 8. Spa Set Ti the ut	adjustn 18.91 ace hea to the r ilisation Jan	19.16 nent to tl 19.16 ting requirement int factor for Feb	19.56 he mean 19.56 uirement ternal ten	20.05 internal 20.05 nperaturusing Ta	20.4 tempera 20.4 re obtain able 9a	20.57 ature fro	20.62 pm Table 20.62 rep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	opriate 20.06 t Ti,m=(19.42 76)m an	18.86 d re-cald	culate	
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m=	adjustn 18.91 ace hea to the rilisation Jan ation face	19.16 nent to tl 19.16 ting requirement int factor for general for general for general factor factor for general factor for general factor for general factor factor for general factor fa	19.56 he mean 19.56 uirement ernal ten or gains t Mar ains, hm	20.05 internal 20.05 inperaturusing Ta Apr : 0.79	20.4 tempers 20.4 re obtainable 9a May	20.57 ature fro 20.57 eed at st	20.62 m Table 20.62 eep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	20.06 t Ti,m=(19.42 76)m an	18.86 d re-calc	culate	(93)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m=	adjustn 18.91 ace hea to the rilisation Jan ation face	19.16 nent to tl 19.16 ting requirement int factor for general for general for general factor factor for general factor for general factor for general factor factor for general factor fa	19.56 he mean 19.56 uirement ernal ten or gains t Mar ains, hm	20.05 internal 20.05 inperaturusing Ta Apr : 0.79	20.4 tempers 20.4 re obtainable 9a May	20.57 ature fro 20.57 eed at st	20.62 m Table 20.62 eep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	20.06 t Ti,m=(19.42 76)m an	18.86 d re-calc	culate	(93)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m=	adjustn 18.91 ace hea i to the r illisation Jan ation face 0.94 Il gains, 508.58	19.16 nent to the second responsible second respons	19.56 he mean 19.56 uirement ernal ten or gains u Mar ains, hm 0.88 , W = (94	20.05 internal 20.05 nperaturusing Ta Apr : 0.79 in x (84) 574.14	20.4 Itempera 20.4 Te obtainable 9a May 0.66 4)m 510.46	20.57 ature fro 20.57 aed at st Jun 0.49	20.62 cm Table 20.62 ep 11 of Jul 0.36	20.61 4e, who 20.61 Table 9 Aug	20.5 ere appro 20.5 b, so that Sep 0.62	opriate 20.06 t Ti,m=(19.42 76)m an Nov	18.86 d re-calc	culate	(93)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m=	adjustn 18.91 ace hea i to the r illisation Jan ation face 0.94 Il gains, 508.58	19.16 nent to the second responsible second respons	19.56 he mean 19.56 uirement ernal ten or gains t Mar ains, hm 0.88 , W = (94	20.05 internal 20.05 nperaturusing Ta Apr : 0.79 in x (84) 574.14	20.4 I tempera 20.4 Te obtain able 9a May 0.66 4)m 510.46	20.57 ature fro 20.57 aed at st Jun 0.49	20.62 cm Table 20.62 ep 11 of Jul 0.36	20.61 4e, who 20.61 Table 9 Aug	20.5 ere appro 20.5 b, so that Sep 0.62	opriate 20.06 t Ti,m=(19.42 76)m an Nov	18.86 d re-calc	culate	(93)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m=	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera	19.16 nent to the second record for green interpretation for green inte	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1	20.05 internal 20.05 nperatur using Ta Apr : 0.79 l)m x (84 574.14 perature 8.9	20.4 tempera 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta	20.57 ature fro 20.57 aed at st Jun 0.49 376 able 8 14.6	20.62 om Table 20.62 eep 11 of Jul 0.36	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71	20.5 ere appro 20.5 b, so that Sep 0.62 382.99	opriate 20.06 t Ti,m=(Oct 0.83 462.28	19.42 76)m an Nov 0.92	18.86 d re-calc Dec 0.95	culate	(93) (94) (95)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera	19.16 nent to the second results of the seco	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1	20.05 internal 20.05 nperatur using Ta Apr : 0.79 l)m x (84 574.14 perature 8.9	20.4 tempera 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta	20.57 ature fro 20.57 aed at st Jun 0.49 376 able 8 14.6	20.62 om Table 20.62 eep 11 of Jul 0.36 260.93	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71	20.5 ere appro 20.5 b, so that Sep 0.62 382.99	opriate 20.06 t Ti,m=(Oct 0.83 462.28	19.42 76)m an Nov 0.92	18.86 d re-calc Dec 0.95	culate	(93) (94) (95)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m=	adjustn 18.91 ace hea to the rillisation Jan ation fac 0.94 Il gains, 508.58 aly avera 4.3 loss rate 1005.74 e heatine	19.16 nent to the second record for green interpretation for green inte	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1 Frnal tem 6.5 an intern	20.05 internal 20.05 Inperature 8.9 al tempe 751.54	20.4 tempera 20.4 re obtain able 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4	20.57 ature fro 20.57 aed at st Jun 0.49 376 able 8 14.6 Lm , W 395.07	20.62 cep 11 of Jul 0.36 260.93 16.6 =[(39)m	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5	19.42 76)m and Nov 0.92 479.27 7.1	18.86 d re-calc Dec 0.95 489.36	culate	(93) (94) (95) (96)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m=	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera 4.3 loss rate	19.16 nent to the second record for green interpretation for green inte	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1 Frnal tem 6.5 an intern	20.05 internal 20.05 Inperature 8.9 al tempe 751.54	20.4 tempera 20.4 re obtain able 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4	20.57 ature fro 20.57 aed at st Jun 0.49 376 able 8 14.6 Lm , W 395.07	20.62 cep 11 of Jul 0.36 260.93 16.6 =[(39)m 265.59	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5	19.42 76)m and Nov 0.92 479.27 7.1	18.86 d re-calc Dec 0.95 489.36		(93) (94) (95) (96) (97)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m= Space	adjustn 18.91 ace hea to the rillisation Jan ation fac 0.94 Il gains, 508.58 aly avera 4.3 loss rate 1005.74 e heatine	19.16 nent to the second results of the seco	19.56 he mean 19.56 uirement remail ten or gains to Mar ains, hm 0.88 , W = (94 577.1 ernal tem 6.5 an internal ement for	20.05 internal 20.05 nperaturating Ta Apr : 0.79 i)m x (84 574.14 perature 8.9 al tempe 751.54 r each m	20.4 I tempera 20.4 Te obtainable 9a May 0.66 4)m 510.46 E from Ta 11.7 Erature, 584.4 month, k\	20.57 ature fro 20.57 ed at st Jun 0.49 376 able 8 14.6 Lm , W 395.07 Wh/mor	20.62 cep 11 of Jul 0.36 260.93 16.6 =[(39)m 265.59 tth = 0.02	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59 24 x [(97	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86)m - (95	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5)m] x (4 128.88	19.42 76)m and Nov 0.92 479.27 7.1 832.71 1)m 254.48	18.86 d re-calc Dec 0.95 489.36 4.2 997.49 378.05	tulate 1837.42	(93) (94) (95) (96)
Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m= Space (98)m=	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera 4.3 loss rate 1005.74 e heatine 369.88	19.16 nent to tl 19.16 ting require mean int factor for groups 0.92 hmGm 1550.42 age exter 4.9 e for mean interpretation of the second of the	19.56 he mean 19.56 uirement remail ten or gains to Mar ains, hm 0.88 , W = (94 577.1 ernal tem 6.5 an internal ement for	20.05 internal 20.05 Inperaturation of the second of the	20.4 Itempera 20.4 Te obtain able 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4 nonth, k\ 55.01	20.57 ature fro 20.57 ed at st Jun 0.49 376 able 8 14.6 Lm , W 395.07 Wh/mor	20.62 cep 11 of Jul 0.36 260.93 16.6 =[(39)m 265.59 tth = 0.02	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59 24 x [(97	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86 0	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5)m] x (4 128.88	19.42 76)m and Nov 0.92 479.27 7.1 832.71 1)m 254.48	18.86 d re-calc Dec 0.95 489.36 4.2 997.49 378.05		(93) (94) (95) (96) (97)

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 includes boilers, heat pumps, geothermal and waste heat from power stations		four other heat sources;	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 comm	nunity heating system		1	(305)
Distribution loss factor (Table 12c) for community heating systematical systems of the community heating systems of the community he	em		1.05	(306)
Space heating Annual space heating requirement			kWh/year 1837.42]
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1929.29	(307a)
Efficiency of secondary/supplementary heating system in % (fr	om Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary sys	stem (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2291.68	_
If DHW from community scheme:			2201.00	_
Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2406.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	43.36	(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	n outside		225.81	(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) =	225.81	(331)
Energy for lighting (calculated in Appendix L)			381.27	(332)
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 usi) ng two fuels repeat (363) to	(366) for the second fue	89.5	(367a)
CO2 associated with heat source 1 [(307b)	+(310b)] x 100 ÷ (367b) x	0.22	1046.35	(367)
Electrical energy for heat distribution	[(313) x	0.52	22.5	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2) =	1068.85	(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	0.52	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		1068.85	(376)
CO2 associated with electricity for pumps and fans within dwe	lling (331)) x	0.52	117.19	(378)

CO2 associated with electricity for lighting		(332))) x	0.52	=	197.88	(379)
Total CO2, kg/year	sum of (376)(382) =				1383.92	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				15.11	(384)
El rating (section 14)					86.42	(385)

			User D	Notaile:						
	\". F = T		USELL					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 20 ⁷	12		Strom: Softwa					018096 on: 1.0.5.12	
Software Hame.	Stroma i S/ti 20		operty.	Address				VCISIC	71. 1.0.0.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	7(0-)	Volume(m ³	<u>-</u>
	\	\			(1a) x	2	2.65	(2a) =	242.74	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	91.6	(4)					_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	242.74	(5)
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır
N. selven of all leaves a	heating	heating	· —		, ,			40		_
Number of chimneys	0 +	0] † [0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] † L	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	3	X '	10 =	30	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	Sa)+(6b)+(7a	a)+(7b)+(7c) =	Г	30		÷ (5) =	0.12	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.12	(0)
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber resent, use the value corre				•	ruction			0	(11)
deducting areas of openi		sponding to	ine great	er wan are	a (aitei					
If suspended wooden	floor, enter 0.2 (unsea	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 s	tripped							0	(14)
Window infiltration				0.25 - [0.2	. ,	_	. (45)		0	(15)
Infiltration rate	.50			(8) + (10)		, , ,	, ,		0	(16)
Air permeability value, If based on air permeabil	· ·		•	•	•	etre of e	envelope	area	5	(17)
Air permeability value applie						is beina u	sed		0.37	(18)
Number of sides sheltere		0 00011 00111	o o. a ao,	groo a po.			000		4	(19)
Shelter factor				(20) = 1 -	(0.0 75 x (1	19)] =			0.7	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.26	(21)
Infiltration rate modified f	or monthly wind spee	d								
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]	
								<u> </u>	J	

0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31]	
alculate effec		-	rate for t	he appli	cable ca	se					!	_	——————————————————————————————————————
If mechanical If exhaust air he			andiv N. (2	3h) - (22c) v Emy (c	auation (N	JEN otho	avica (22h	\ _ (222)			0	(2
If balanced with) = (23a)			0	(2
		•	-	_					7h.\ (00h) [/	1 (00.0)	0	(2
a) If balance	o mech	anicai ve	niliation 0	with ne	at recove		$\frac{1R}{0}$	0 = (22	0 (10)	23b) x [0) ÷ 100]]	(2
b) If balance												J	(-
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h							<u> </u>					J	
if (22b)n				•	•				5 × (23b))			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	n from l	oft				J	
if (22b)n				•	•				0.5]				
4d)m= 0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55]	(:
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55]	(:
s. Heat losse	e and he	at lose r	naramete	or.								_	
. Heat losse LEMENT	Gros	·	Openin		Net Ar	A 2	U-valı	IΩ	AXU		k-valu	۵	ΑΧk
LEIVIEINI	area	_	m	_	A ,r		W/m2		(W/I	۲)	kJ/m².		kJ/K
indows Type	1				3.29	x1.	/[1/(1.4)+	0.04] =	4.36				(:
indows Type	2				3.64	x1.	/[1/(1.4)+	0.04] =	4.83				(:
indows Type	3				1.65	x1.	/[1/(1.4)+	0.04] =	2.19				(
indows Type	4				2.12	x1.	/[1/(1.4)+	0.04] =	2.81				(
alls Type1	64.	1	21.6	2	42.48	3 x	0.18	─ <u>-</u>	7.65	=			(:
alls Type2	12.		0		12.2	=	0.18		2.2	ᆿ 片		= =	(;
otal area of e					76.3	=	0.10		2.2				(
or windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	e)+0.041 a	ns aiven in	paragrapi	h 3.2	(
include the area								1(), 0	-,	J	, g p.		
bric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				38.51	(
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(
r design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste				.a.:.a. A.:	ا بناممم	,							
nermal bridge	•	,		• .	•	`						3.81	(
letails of therma Ital fabric he		are not kn	OWII (30) =	= 0.05 X (3	1)			(33) +	(36) =			42.32	2 (
entilation hea		alculated	monthly	/					= 0.33 × (25)m x (5))	72.02	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
3)m= 44.5	44.33	44.16	43.37	43.22	42.52	42.52	42.4	42.79	43.22	43.52	43.83	1	(
		<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>			<u> </u>	L	J	,
eat transfer of 86.83	86.65	86.48	85.69	85.54	84.84	84.84	84.72	85.11	= (37) + (3 85.54	85.84	86.15	1	

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.95	0.95	0.94	0.94	0.93	0.93	0.93	0.92	0.93	0.93	0.94	0.94		
Number of day	ra in ma	oth /Tabl	lo 10)					,	Average =	Sum(40) ₁ .	12 /12=	0.94	(40)
Number of day Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					<u> </u>	<u> </u>		Į	<u> </u>		<u> </u>		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occur if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		65		(42)
if TFA £ 13.9 Annual averag	•	ator usac	no in litro	se par da	w Vd av	orago –	(25 v NI)	± 36		0.7			(42)
Reduce the annua									se target o		.07		(43)
not more that 125	litres per _l	person per	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 106.77	102.89	99.01	95.12	91.24	87.36	87.36	91.24	95.12	99.01	102.89	106.77		
Energy content of	hat water	used sel	ouloted m	anthly — 1	100 v Vd r	n v nm v [Tm / 2600			m(44) ₁₁₂ =	L	1164.79	(44)
Energy content of													
(45)m= 158.34	138.49	142.91	124.59	119.55	103.16	95.59	109.69	111	129.36	141.21	153.34	4507.00	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =	• [1527.23	(45)
(46)m= 23.75	20.77	21.44	18.69	17.93	15.47	14.34	16.45	16.65	19.4	21.18	23		(46)
Water storage		21.44	10.00	17.00	10.47	14.04	10.40	10.00	10.4	21.10	20		(10)
Storage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	nd 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)			
Water storage					(1.14/1	/ I \					1		
a) If manufact				or is kno	wn (kWh	n/day):				1.	65		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	89		(50)
b) If manufaction Hot water stora			-								0		(51)
If community h	•			0 = (1,111,0,00	•97					<u> </u>		(0.)
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.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(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 Appendi	x H	
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(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	e 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 o	alculated	for each	month ((61)m –	(60) ÷ '	R65 V (11	/m						
(61)m= 0	0	0	0	0	00) - (0 0) 0	0	T 0	0	0	1	(61)
	_!		<u> </u>	alculated	l for ea	ch month					<u> </u>	J · (59)m + (61)m	` ,
(62)m= 209.27		193.83	173.87	170.47	152.44		160.6		180.29	190.49	204.27	1	(62)
Solar DHW inpu												<u></u>	` ,
(add addition											· · · · · · · · · · · · · · · · · ·		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	7	(63)
Output from	water hea	ter				_						_	
(64)m= 209.2		193.83	173.87	170.47	152.44	146.52	160.6	2 160.29	180.29	190.49	204.27	1	
	Į					-1	O	utput from w	ater heate	er (annual)	112	2126.84	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	 n]	_
(65)m= 93.39	82.84	88.26	80.85	80.49	73.73	72.53	77.2	76.34	83.75	86.38	91.73	1	(65)
include (57	')m in cald	culation (of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts										
Jan	T '	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 132.35	5 132.35	132.35	132.35	132.35	132.35	132.35	132.3	5 132.35	132.35	132.35	132.35]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5				_	
(67)m= 21.85	19.41	15.78	11.95	8.93	7.54	8.15	10.59	14.22	18.05	21.07	22.46]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation	_13 or L1	3a), a	so see Ta	ble 5		-	_	
(68)m= 241.99	9 244.5	238.17	224.7	207.7	191.71	181.04	178.5	3 184.85	198.33	215.33	231.31]	(68)
Cooking gair	s (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	5	-	-	_	
(69)m= 36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23]	(69)
Pumps and f	ans gains	(Table 5	5a)									_	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m= -105.8	8 -105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.8	8 -105.88	-105.88	-105.88	-105.88]	(71)
Water heatin	g gains (T	able 5)										_	
(72)m= 125.52	2 123.28	118.62	112.29	108.19	102.4	97.48	103.7	8 106.02	112.57	119.97	123.29]	(72)
Total interna	al gains =				(6	6)m + (67)n	n + (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 455.07	7 452.9	438.29	414.65	390.52	367.36	352.37	358.6	370.8	394.65	422.07	442.77		(73)
6. Solar gai													
Solar gains are		_					ations to		ne applical		tion.		
Orientation:	Access F Table 6d	actor	Area m²			ux able 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
Southworte o					_		, ,				_	. ,	1(70)
Southwesto or		X	3.2		X	36.79]	0.63		0.7	=	25.94	(79)
Southwest _{0.9x} Southwest _{0.9x}		X	1.6		x	36.79	ļĻ	0.63	×	0.7	_ =	13.01](79)] ₍₇₀₎
		X	2.1		x	36.79	ļĻ	0.63	×	0.7	=	16.72](79)] ₍₇₀₎
Southwesto or		X	3.2		x	62.67	ļĻ	0.63	×	0.7	=	44.19	[(79)
Southwest _{0.9x}	0.54	X	1.6	55	Χ	62.67	J L	0.63	X	0.7	=	22.16	(79)

О		1		1		ı				1		٦
Southwest _{0.9x}	0.54	X	2.12	X	62.67		0.63	X	0.7	=	28.48	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75		0.63	X	0.7	=	60.47	(79)
Southwest _{0.9x}	0.54	X	1.65	X	85.75		0.63	X	0.7] =	30.33	(79)
Southwest _{0.9x}	0.54	X	2.12	X	85.75		0.63	X	0.7	=	38.96	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25		0.63	X	0.7	=	74.92	(79)
Southwest _{0.9x}	0.54	X	1.65	X	106.25		0.63	X	0.7	=	37.57	(79)
Southwest _{0.9x}	0.54	X	2.12	x	106.25		0.63	X	0.7	=	48.28	(79)
Southwest _{0.9x}	0.54	X	3.29	X	119.01		0.63	X	0.7	=	83.92	(79)
Southwest _{0.9x}	0.54	X	1.65	X	119.01		0.63	X	0.7	=	42.09	(79)
Southwest _{0.9x}	0.54	X	2.12	X	119.01		0.63	X	0.7	=	54.08	(79)
Southwest _{0.9x}	0.54	X	3.29	x	118.15		0.63	X	0.7	=	83.31	(79)
Southwest _{0.9x}	0.54	X	1.65	X	118.15		0.63	X	0.7	=	41.78	(79)
Southwest _{0.9x}	0.54	X	2.12	x	118.15		0.63	X	0.7	=	53.68	(79)
Southwest _{0.9x}	0.54	X	3.29	X	113.91		0.63	X	0.7	=	80.32	(79)
Southwest _{0.9x}	0.54	X	1.65	x	113.91		0.63	X	0.7	=	40.28	(79)
Southwest _{0.9x}	0.54	X	2.12	x	113.91		0.63	X	0.7	=	51.76	(79)
Southwest _{0.9x}	0.54	X	3.29	x	104.39		0.63	X	0.7	=	73.61	(79)
Southwest _{0.9x}	0.54	X	1.65	x	104.39		0.63	x	0.7	=	36.92	(79)
Southwest _{0.9x}	0.54	X	2.12	x	104.39		0.63	X	0.7	=	47.43	(79)
Southwest _{0.9x}	0.54	X	3.29	x	92.85		0.63	X	0.7	=	65.47	(79)
Southwest _{0.9x}	0.54	X	1.65	x	92.85		0.63	X	0.7	=	32.84	(79)
Southwest _{0.9x}	0.54	x	2.12	x	92.85		0.63	x	0.7] =	42.19	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27		0.63	x	0.7	=	48.84	(79)
Southwest _{0.9x}	0.54	X	1.65	x	69.27		0.63	x	0.7] =	24.5	(79)
Southwest _{0.9x}	0.54	x	2.12	x	69.27		0.63	x	0.7] =	31.47	(79)
Southwest _{0.9x}	0.54	x	3.29	x	44.07		0.63	x	0.7] =	31.08	(79)
Southwest _{0.9x}	0.54	X	1.65	x	44.07		0.63	x	0.7] =	15.59	(79)
Southwest _{0.9x}	0.54	x	2.12	x	44.07		0.63	x	0.7] =	20.02	(79)
Southwest _{0.9x}	0.54	x	3.29	x	31.49		0.63	x	0.7] =	22.2	(79)
Southwest _{0.9x}	0.54	x	1.65	x	31.49		0.63	x	0.7	j =	11.14	(79)
Southwest _{0.9x}	0.54	x	2.12	x	31.49		0.63	x	0.7	=	14.31	(79)
Northwest _{0.9x}	0.54	x	3.64	х	11.28	x	0.63	x	0.7	j =	35.21	(81)
Northwest 0.9x	0.54	x	3.64	x	22.97	x	0.63	X	0.7	j =	71.67	(81)
Northwest _{0.9x}	0.54	x	3.64	x	41.38	х	0.63	X	0.7	j =	129.13	(81)
Northwest _{0.9x}	0.54	x	3.64	x	67.96	х	0.63	X	0.7	j =	212.06	(81)
Northwest 0.9x	0.54	x	3.64	x	91.35	x	0.63	x	0.7	j =	285.05	(81)
Northwest _{0.9x}	0.54	x	3.64	x	97.38	x	0.63	x	0.7] =	303.9	(81)
Northwest _{0.9x}	0.54	x	3.64	x	91.1	x	0.63	x	0.7	i =	284.29	(81)
Northwest _{0.9x}	0.54	X	3.64	x	72.63	x	0.63	x	0.7	=	226.64	(81)
Northwest _{0.9x}	0.54	X	3.64	x	50.42	x	0.63	x	0.7	=	157.34	(81)
Northwest _{0.9x}	0.54	X	3.64	x	28.07	x	0.63	x	0.7	=	87.59	(81)
L		1		ı		ı				,		_

Northwest _{0.9x}	0.54	х	3.6	64	х	14.2	х	0.63	х	0.7	=	44.3	(81)
Northwest 0.9x	0.54	х	3.6	64	x	9.21	x	0.63	_ x [0.7	=	28.75	(81)
_							<u> </u>						_
Solar gains in	watts, ca	alculated	for eac	h month			(83)m = 5	Sum(74)m .	(82)m			,	
(83)m= 90.88	166.5	258.88	372.84	465.13	482.67	456.65	384.6	297.84	192.4	110.99	76.4		(83)
Total gains – i	nternal a				<u> </u>							1	
(84)m= 545.95	619.4	697.17	787.49	855.65	850.03	809.02	743.2	668.64	587.05	533.06	519.17		(84)
7. Mean inter	nal temp	perature	(heating	season)								
Temperature	during h	neating p	eriods ir	the livi	ng area	from Tal	ble 9, Th	11 (°C)				21	(85)
Utilisation fac	tor for g	ains for I	iving are	ea, h1,m	(see T	able 9a)		1	1	1		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.95	0.82	0.62	0.46	0.52	0.8	0.97	1	1		(86)
Mean interna	l temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tabl	le 9c)				_	
(87)m= 20.04	20.17	20.4	20.69	20.9	20.99	21	21	20.94	20.66	20.29	20.01		(87)
Temperature	during h	neating p	eriods ir	rest of	dwelling	g from Ta	able 9, T	h2 (°C)					
(88)m= 20.13	20.13	20.13	20.14	20.14	20.15	20.15	20.15	20.14	20.14	20.14	20.13		(88)
Utilisation fac	tor for a	ains for i	rest of d	welling.	h2.m (s	ee Table	9a)		•	•	•	-	
(89)m= 1	0.99	0.98	0.93	0.77	0.55	0.37	0.43	0.73	0.96	0.99	1]	(89)
Mean interna	l temner	ature in	tha rast	of dwelli	na T2 (follow eta	one 3 to	7 in Tahl	<u> </u> a 0c	<u>!</u>	<u> </u>	ı	
(90)m= 18.83	19.03	19.36	19.77	20.05	20.14	20.14	20.14	20.1	19.74	19.22	18.8]	(90)
(00)									Į	g area ÷ (4		0.45	(91)
Maan interne		otumo (fo	ماند مماه س	مبياء ماء	الممال	41 A T4	. /4 41	۸) To					``
Mean interna (92)m= 19.38	19.55	19.83	20.19	20.44	20.52	20.53	20.53	20.48	20.16	19.7	19.35	1	(92)
Apply adjustr	<u> </u>				l		l			10.7	10.00	J	(02)
(93)m= 19.38	19.55	19.83	20.19	20.44	20.52	20.53	20.53	20.48	20.16	19.7	19.35]	(93)
8. Space hea	iting requ	uirement											
Set Ti to the	mean int	ternal ter	nperatu	e obtair	ned at st	tep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-cal	culate	
the utilisation					1	i		1	ī	ī		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	0.98	0.93	0.79	0.58	0.41	0.47	0.75	0.96	0.99	1	1	(94)
Useful gains,	Į				0.50	1 0.41	0.47	0.73	0.50	0.55	'	J	(0.)
(95)m= 544.1	614.75	682.56	730.85	678.02	493.41	332.65	347.96	504.68	561.49	529	517.83]	(95)
Monthly aver	age exte						<u>ļ</u>	ļ	<u> </u>	<u> </u>	<u> </u>	J	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2]	(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	ı– (96)m]				
(97)m= 1309.31	1269.32	1152.79	967.29	747.21	502.4	333.61	349.98	543.03	817.52	1081.99	1305.14		(97)
Space heatin	g require	ement fo	r each n	nonth, k	Wh/mor	nth = 0.02	24 x [(97	')m – (95)m] x (4	1)m		•	
(98)m= 569.32	439.88	349.85	170.23	51.47	0	0	0	0	190.49	398.15	585.75		
							Tota	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	2755.14	(98)
Space heatin	g require	ement in	kWh/m²	/year								30.08	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating s	ystems	including	micro-(CHP)					
Space heatii													
Fraction of sp	oace hea	at from se	econdar	y/supple	mentar	y 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) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system,	%						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above) 569.32 439.88 349.85 170.23 51.47	0	0	0	0	190.49	398.15	585.75]	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$				U	130.43	330.13	303.73		(211)
608.9 470.45 374.17 182.07 55.05	0	0	0	0	203.73	425.83	626.47		(211)
			Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	2946.67	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)	-							1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0	0 215) _{15.10} 12	0		7(245)
Water heating			Total	i (KVVII/yea	ar) =3um(2	213) _{15,1012}	<u>-</u>	0	(215)
Output from water heater (calculated above)									
·	152.44	146.52	160.62	160.29	180.29	190.49	204.27		
Efficiency of water heater								79.8	(216)
` '	79.8	79.8	79.8	79.8	84.96	86.74	87.47		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	191.03	183.61	201.28	200.86	212.2	219.62	233.54		
			Tota	I = Sum(2	19a) ₁₁₂ =			2530.95	(219)
Annual totals					1.4	Mbhaa			
Space heating fuel used main evetem 1					K	Wh/year		kWh/yea	<u>r</u>
Space heating fuel used, main system 1					K	vvn/year		2946.67	r
Water heating fuel used					K	vvn/year			r
Water heating fuel used Electricity for pumps, fans and electric keep-hot					K	wnyear		2946.67	
Water heating fuel used					K	wnyear	30	2946.67	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot					K	wnyear		2946.67	
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =		30	2946.67	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue			sum	of (230a).			30	2946.67 2530.95	(230c) (230e)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	ns inclu	ding mid					30	2946.67 2530.95	(230c) (230e) (231)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting					(230g) =		30 45	2946.67 2530.95 75 385.9	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene				(230g) =	ion fac	30 45	2946.67 2530.95	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene	e rgy n/year			(230g) =	ion fac 2/kWh	30 45	2946.67 2530.95 75 385.9	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	Ene kWł	ergy n/year x			(230g) = Emiss kg CO	ion fac 2/kWh	30 45 tor	2946.67 2530.95 75 385.9 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Ene kWł (211)	ergy n/year x			(230g) = Emiss kg CO: 0.2	ion fac 2/kWh 16	30 45 tor	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0	(230c) (230e) (231) (232) Sar (261) (263)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	ergy n/year x x			(230g) = Emiss kg CO:	ion fac 2/kWh 16	30 45 tor = =	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0 546.69	(230c) (230e) (231) (232) Sar (261) (263) (264)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kWh (211) (215) (219) (261)	ergy n/year x x + (262) -	cro-CHP		(230g) = Emiss kg CO: 0.2 0.5	ion fac 2/kWh 16	30 45 tor = =	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0 546.69 1183.17	(230c) (230e) (231) (232) Sar (261) (263) (264) (265)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	ergy n/year x x + (262) -	cro-CHP		(230g) = Emiss kg CO: 0.2	ion fac 2/kWh 16 19	30 45 tor = =	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0 546.69	(230c) (230e) (231) (232) Sar (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1422.37 (272)

TER = 15.53 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:10

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Total Floor Area: 83.2m2

Dwelling Details:

NEW DWELLING DESIGN STAGE

2_02 - 2B4P Site Reference: **Tottenham Mews** Plot Reference:

Address:

Client Details:

Name:

Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

15.29 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 14.17 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 32.7 kWh/m²

OK

OK

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70)

Floor (no floor)

Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	OK
MVHR efficiency:	78%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	3.3m²	
Windows facing: North East	6.34m²	
Windows facing: North East	7.29m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blin	d
	Closed 100% of daylight hours	
40 Vov footures		
10 Key features	0.0 2/ 21:	
Air permeablility	3.0 m ³ /m ² h	
Windows U-value	1.1 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	USGI^L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	F	Property	Address	2_02 -	2B4P				
Address: 1. Overall dwelling dime	oneione:								
1. Overall dwelling diffic	511310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	220.48	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	83.2	(4)			•		_
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	220.48	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x -	10 =	0	(7a)
Number of passive vents	3			Ē	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	x	40 =	0	(7c)
				_					
		_ \	 \	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		, a to (_/),	00		o (o) to	(1.0)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	1.25 for steel or timber frame or resent, use the value corresponding to			•	ruction			0	(11)
deducting areas of openi		o irie grea	ter wall are	a (aitei					
•	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15) (16)
	q50, expressed in cubic metro	es per ho					area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$	•	•	•				0.15	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere	ed		(20) – 1	10 075 v (4	10)1 –			4	(19)
Shelter factor	ting chalter feater		(20) = 1 - (21) = (18)		19)] =			0.7	(20)
Infiltration rate incorpora Infiltration rate modified to	•		(21) = (10	/ X (20) =				0.1	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	1 3		1			l	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (20a) (2	2)m : 4	_	-		-	-		-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
(ΣΣα)ΠΤ 1.21 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32		I 1.00	1.12	1.10	J	

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effe		_	rate for t	he appli	cable ca	se	-	-	-	-	_	0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fror	n Table 4h) =				66.3	(23
a) If balance	ed mech	anical ve	entilation	with he	at recove	ery (MV	HR) (24a	a)m = (22)	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
24a)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (I	ИV) (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)r			ntilation on the character of the charac	•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r			ole hous m = (22l	•					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= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(25
3. Heat losse	s and he	eat loss i	paramet	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Vindows Type	e 1				1.65	_x 1	/[1/(1.1)+	0.04] =	1.74				(27
Vindows Type	2				3.17	x1	/[1/(1.1)+	0.04] =	3.34				(27
Vindows Type	e 3				7.29	x1	/[1/(1.1)+	0.04] =	7.68				(2
Valls Type1	35		16.9	3	18.07	, X	0.2	= [3.61				(29
Valls Type2	15.4	4	0		15.4	X	0.19	= [2.85				(29
otal area of e	lements	, m²			50.4								(3
for windows and * include the area						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	n 3.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.3	(3:
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design asses: an be used inste				construct	ion are no	t known pi	ecisely the	e indicative	values of	TMP in Ta	able 1f		
hermal bridg				usina Ac	pendix l	<						7.56	(36
details of therma	`	,		• .	•							7.00	(0)
otal fabric he	at loss							(33) +	(36) =			31.86	(3
entilation hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	[
38)m= 22	21.81	21.62	20.66	20.47	19.52	19.52	19.33	19.9	20.47	20.85	21.24		(3
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
39)m= 53.86	53.67	53.48	52.53	52.34	51.38	51.38	51.19	51.76	52.34	52.72	53.1]	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.65	0.65	0.64	0.63	0.63	0.62	0.62	0.62	0.62	0.63	0.63	0.64		
									Average =	Sum(40) ₁ .	12 /12=	0.63	(40)
Number of day	<u> </u>	<u> </u>	· ·						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4.1)
(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 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		52		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.07		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								<u> - 15 </u>					
(44)m= 103.48	99.71	95.95	92.19	88.42	84.66	84.66	88.42	92.19	95.95	99.71	103.48		
	!	!	<u> </u>	ļ		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1128.82	(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 (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.45	134.21	138.49	120.74	115.85	99.97	92.64	106.31	107.57	125.37	136.85	148.61		
					()		h (40		Total = Su	m(45) ₁₁₂ =	= [1480.06	(45)
If instantaneous v	vater neati 1		of use (no	not water	storage),		· · ·) tO (61)			· · · · · · · · · · · · · · · · · · ·		
(46)m= 23.02 Water storage	20.13	20.77	18.11	17.38	15	13.9	15.95	16.14	18.81	20.53	22.29		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(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):				2.	24		(48)
Temperature f	actor fro	m Table	2b							0	.6		(49)
Energy lost fro		•					(48) x (49)) =		1.	34		(50)
b) If manufactHot water stor			-										(51)
If community h	-			C Z (KVV	ii/iiti G/GC	iy <i>)</i>					0		(31)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	rstorage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								1.	34		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	t loss (ar	nnual) fro	om Table	<u>-</u> -							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	ter 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 ca	alculated	for each	month (61)m =	(60) ÷ 3	865 × (41)m						
(61)m= 0	0	0	0	0	0	O	0	0	0	0	0]	(61)
Total heat red	uired for	water he	eating ca	alculated	for ead	h month	(62)n	า = 0.85 ×	(45)m -	 ⊦ (46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 218.38	`	203.42	183.57	180.78	162.8	157.57	171.2		190.29	`	213.54	l` <i>´ ´</i>	(62)
Solar DHW input	: calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ente	r '0' if no sola	ar contrib	ution to wat	er heating)	ı	
(add addition	al lines if	FGHRS	and/or \	vwhrs	applies	s, see Ap	pendi	x G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	vater hea	ter					•	•		•	•		
(64)m= 218.38	192.85	203.42	183.57	180.78	162.8	157.57	171.2	23 170.41	190.29	199.68	213.54		
	•					•		Output from v	vater heat	er (annual)	112	2244.52	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	+ (61	l)m] + 0.8	x [(46)n	n + (57)m	+ (59)m	ı]	
(65)m= 102.96	91.54	97.99	90.41	90.46	83.51	82.74	87.2	9 86.03	93.63	95.77	101.35		(65)
include (57)m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwelli	ng or hot v	vater is	from com	munity h	neating	
5. Internal g	jains (see	e Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.0	04 126.04	126.04	126.04	126.04		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso se	e Table 5		•	•	•	
(67)m= 20.45	18.16	14.77	11.18	8.36	7.06	7.63	9.91	13.3	16.89	19.72	21.02		(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	За), а	lso see Ta	able 5	•	•	•	
(68)m= 226	228.34	222.43	209.85	193.97	179.05	169.07	166.7	73 172.64	185.22	2 201.1	216.03	1	(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), alsc	see Table	e 5				
(69)m= 35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	1	(69)
Pumps and fa	ans gains	(Table 5	ia)							<u>'</u>		ı	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)						!		
(71)m= -100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.8	33 -100.83	-100.83	3 -100.83	-100.83	1	(71)
Water heating	g gains (T	able 5)										•	
(72)m= 138.39	136.22	131.71	125.57	121.59	115.98	111.21	117.3	32 119.49	125.84	133.01	136.23]	(72)
Total interna	l gains =	!			(66	6)m + (67)m	า + (68)	m + (69)m +	(70)m +	(71)m + (72)m	ı	
(73)m= 445.65	443.54	429.72	407.42	384.73	362.89	348.73	354.7	77 366.24	388.76	414.64	434.08]	(73)
6. Solar gair	ns:						1		1				
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions to	convert to t	he applic	able orienta	tion.		
Orientation:			Area			ux		_ g		FF		Gains	
	Table 6d		m²		Ta	able 6a		Table 6b)	Table 6c		(W)	
Northeast _{0.9x}	0.54	X	3.1	7	X	11.28] x [0.44	X	0.8	=	12.24	(75)
Northeast _{0.9x}	0.54	X	7.2	29	X	11.28] x	0.44	X	0.8	=	14.07	(75)
Northeast 0.9x	0.54	X	3.1	7	X	22.97	x	0.44	X	0.8	=	24.91	(75)
Northeast 0.9x	0.54	X	7.2	29	X	22.97] x [0.44	x	0.8	=	28.64	(75)
Northeast 0.9x	0.54	X	3.1	7	X	41.38	x [0.44	X	0.8	=	44.88	(75)

Northeast 0.9%	No. office and						7		_				—
Northeast 0.0x	Northeast _{0.9x}	0.54	7.	29	X	41.38	X	0.44	_ ×	0.8	_ =	51.6	(75)
Northeast 0.9x	<u> </u>	0.54	3.	17	X	67.96	X	0.44	×	0.8	=	73.7	(75)
Northeast 0.9x		0.54	7.	29	X	67.96	X	0.44	×	0.8	=	84.75	(75)
Northeast 0.8x		0.54	3.	17	X	91.35	X	0.44	×	0.8	=	99.07	(75)
Northeast 0.sv	<u> </u>	0.54	7.	29	X	91.35	X	0.44	Х	0.8	=	113.92	(75)
Northeast 0.5x	Northeast _{0.9x}	0.54	3.	17	X	97.38	X	0.44	X	0.8	=	105.62	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	7.	29	X	97.38	X	0.44	Х	0.8	=	121.45	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	3.	17	X	91.1	X	0.44	x	0.8	=	98.81	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	7.	29	X	91.1	X	0.44	х	0.8	=	113.61	(75)
Northeast 0.9x	Northeast 0.9x	0.54	3.	17	X	72.63	X	0.44	X	0.8	=	78.77	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	72.63	X	0.44	x	0.8	=	90.57	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	3.	17	x	50.42	X	0.44	x	0.8	=	54.69	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	50.42	X	0.44	х	0.8	=	62.88	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	3.	17	x	28.07	x	0.44	x	0.8	=	30.44	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	28.07	X	0.44	x	0.8	=	35	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	3.	17	x	14.2	X	0.44	x	0.8	=	15.4	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	14.2	Īx	0.44	×	0.8	=	17.71	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	3.	17	x	9.21	i x	0.44	×	0.8	=	9.99	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	9.21	Īx	0.44	×	0.8	_	11.49	(75)
Southeast 0,9x	Southeast 0.9x	0.54	1.	65	x	36.79	i x	0.44	×	0.8	=	20.77	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	62.67	i x	0.44	×	0.8	=	35.38	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	85.75	j ×	0.44	×	0.8	_ =	48.41	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	106.25	j ×	0.44	×	0.8	_	59.98	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	119.01	i x	0.44	×	0.8		67.19	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	118.15	d x	0.44	= x	0.8	=	66.7	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	113.91	×	0.44	x	0.8	=	64.31	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	104.39	X	0.44	x	0.8	=	58.93	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	92.85	d x	0.44	= x	0.8	=	52.42	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	69.27	j ×	0.44	x	0.8	=	39.1	(77)
Southeast 0.9x					x		d x		x				=
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 47.08					x		d x		=		= =		=
(83)m= 47.08 88.93 144.89 218.44 280.18 293.77 276.73 228.28 169.98 104.55 57.98 39.26 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 492.73 532.47 574.62 625.86 664.91 656.67 625.45 583.05 536.23 493.31 472.62 473.34 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													` ′
(83)m= 47.08 88.93 144.89 218.44 280.18 293.77 276.73 228.28 169.98 104.55 57.98 39.26 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 492.73 532.47 574.62 625.86 664.91 656.67 625.45 583.05 536.23 493.31 472.62 473.34 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in wat	s. calculate	d for eac	h mont	h		(83)m	n = Sum(74)m .	(82)m				
(84)m= 492.73 532.47 574.62 625.86 664.91 656.67 625.45 583.05 536.23 493.31 472.62 473.34 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	T		1	1	$\overline{}$	93.77 276.73				57.98	39.26	1	(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Total gains – inter	nal and sola	ır (84)m	= (73)m	+ (B3)m , watts	'				l.	ı	
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 492.73 532	2.47 574.62	625.86	664.91	6	56.67 625.45	583	.05 536.23	493.31	472.62	473.34		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean internal	temperature	e (heating	g seaso	n)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature dur	ng heating	periods i	n the liv	/ing	area from Ta	ble 9	, Th1 (°C)				21	(85)
(86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation factor f	or gains for	living ar	ea, h1,r	n (s	ee Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		<u> </u>			Ť		A	ug Sep	Oct	Nov	Dec		
	(86)m= 0.95 0.	93 0.89	0.8	0.66	1	0.48 0.36	0.	4 0.62	0.83	0.93	0.96		(86)
	Mean internal ter	nperature ir	living ar	ea T1 (follo	w steps 3 to	7 in T	able 9c)		•	•	•	
		 		 	_	i	1	<u> </u>	20.65	20.23	19.86]	(87)
	<u> </u>			1		ļ	'	1	<u> </u>	1	I.	ı	

Ta		المصادرين		سام مام اس		مال مال	fuero Te	bla O T	ha (00)					
(88)m=	20.39	20.39	eating p	20.4	20.4	20.41	20.41	20.42	20.41	20.4	20.4	20.4		(88)
. ,			ains for i						20.41	20.4	20.4	20.4		(00)
(89)m=	0.95	0.93	0.88	0.78	0.63	0.44	0.31	0.35	0.57	0.81	0.92	0.95		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 1	7 in Tabl	e 9c)				
(90)m=	18.87	19.1	19.49	19.96	20.26	20.39	20.41	20.41	20.34	19.97	19.38	18.83		(90)
	<u> </u>	!	<u>!</u>	,			<u> </u>	ļ.	f	LA = Livin	g area ÷ (4	1) =	0.54	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lina) = fl	LA × T1	+ (1 – fL	A) x T2					
(92)m=	19.42	19.61	19.94	20.34	20.59	20.7	20.73	20.72	20.66	20.34	19.84	19.39		(92)
Apply	adjustr	nent to t	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.42	19.61	19.94	20.34	20.59	20.7	20.73	20.72	20.66	20.34	19.84	19.39		(93)
8. Sp	ace hea	iting requ	uirement											
			ernal ter or gains			ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	-									
(94)m=	0.94	0.92	0.87	0.78	0.64	0.46	0.34	0.37	0.59	0.81	0.91	0.94		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m		r	r	•		•	-		
(95)m=	462.07	488.26	501.88	488.57	424.06	304.85	210.1	218.45	316.85	399.9	429.72	446.95		(95)
		 	rnal tem	i				T						(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)
пеаі (97)m=	814.2	789.72	an intern 718.79	600.73	465.29	313.59	211.96	221.3	339.36	509.83	671.59	806.41		(97)
. ,			ement fo					l				000.11		()
(98)m=	261.98	202.58	161.38	80.76	30.68	0	0	0	0	81.78	174.14	267.44		
		<u> </u>	<u> </u>				ļ	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1260.74	(98)
Space	e heatin	g require	ement in	kWh/m²	/year							[15.15	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme								
			ace hea								unity sch	neme.	0	(301)
	-			-		-	_	Table 1	1) 0 11 11	0110		<u> </u>		(302)
	-		from co	-	-			,, ,	0115			[1	(302)
includes	boilers, h	neat pump	s, geothern	mal and wa	aste heat f					up to four (other heat	sources; th	ne latter	_
Fraction	n of hea	at from (Commun	ity boiler	S								1	(303a)
Fraction	n of tota	al space	heat fro	m Comm	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for conf	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	communi	ity heatii	ng syste	m					1.05	(306)
-	heating	_											kWh/yea	
Annua	l space	heating	requirem	ient									1260.74	
Space	heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	1323.78	(307a)
Efficie	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

Water heating 2244.52 Annual water heating requirement 2244.52 If DHW from community scheme: (64) x (303a) x (305) x (306) = 2356.75 (310a) Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(307e) + (310a)(310e) = 36.81 (313) Cooling System Energy Efficiency Ratio 0.314) 0.314) (310a) Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0.330b (310a) Electricity for pumps and fans within dwelling (Table 4f): (61) x (300a) (300a) (300a) warm air heating system fans 0.330b (300a)	Space heating requirement from secon	dary/supplementary system	(98) x (301) x 1	100 ÷ (308) =	Г	0	(309)
Annual water heating requirement If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) = 2356.75 (310a) Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e)) = 36.81 (313) Cooling System Energy Efficiency Ratio 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 warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 161.39 (331) Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions - Community heating scheme Energy kWh/year kg CO2/kWh kg CO2/kWh 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 fuel Energy for heat distribution (301a) x 0.22 = 888.26 (367) Electrical energy for heat distribution (301a) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363)(366) + (366)(372) = 0.374) CO2 associated with space heating (secondary) (309) x 0.52 = 0.374) CO2 associated with space and water heating (373) + (374) + (375) = 0.52 = 88.36 (376) Total CO2 associated with space and water heating (373) + (374) + (375) = 0.52 = 88.36 (376) Total CO2 associated with space and water heating (373) + (374) + (375) = 0.52 = 88.36 (376) CO2 associated with space and water heating (373) + (374) + (375) = 0.52 = 88.36 (376) Total CO2, kg/year Energy kemiscian (382) (383)	, ,	aa.,,oopp.ooa., ojoio			_		」 ` ′
Water heat from Community boilers (64) x (303a) x (305) x (306) = 2356.75 (310a) Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e) = 36.81 (313) Cooling System Energy Efficiency Ratio 0 (314) (315) (315) (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside 161.39 (330a) warm air heating system fans 0 (330b) (330b) (330b) (330c) (360c) (360c) (360c) (360c) (360c) (360c) (360c)					Г	2244.52	7
Electricity used for heat distribution			(0.4) (0.00.)	(005) (000)	_		
Cooling System Energy Efficiency Ratio	•		, , , , ,		Ļ	2356.75	
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 161.39 (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) = 161.39 (331) Energy for lighting (calculated in Appendix L) 361.13 (332) 12b. CO2 Emissions – Community heating scheme Energy kWh/year Emission factor kg CO2/kwh Emissions kg CO2/kwh Emissions kg CO2/kwh kg CO2/kwh kg CO2/kwh kg CO2/kwh kg CO2/kwh 489.5 (367a) (367a) CO2 associated with heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel kg CO2/kyear 89.5 (367a) (367a) CO2 associated with heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel kg CO2/kyear 89.5 (367a) (367a) CO2 associated with heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel kg CO2/kyear 89.5 (367a) (367a) CO2 associated with heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the	•		0.01 × [(307a)(307	'e) + (310a)(310e	*)] =	36.81	(313)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year electricity for heat distribution electricity for heat form immersion heater or instantaneous heater (363)(366) + (368)(372) electrical energy for heat distribution electricity for pumps and fans within dwelling (373) + (374) + (375) = electrical energy for heat distribution electricity for pumps and fans within dwelling (373) + (374) + (375) = electrical energy for heat distribution electricity for pumps and fans within dwelling (373) + (374) + (375) = electrical energy for heat distribution electricity for pumps and fans within dwelling (373) + (374) + (375) = electrical energy for heat distribution electricity for pumps and fans within dwelling (373) + (374) + (375) = electrical energy for heat distribution electrical energy for heat electricity for pumps and fans within dwelling (373) + (374) + (375) = electrical energy for heat electricity for pumps and fans within dwelling (373) + (376) + (376) + (386) + (3	Cooling System Energy Efficiency Ration	0			L	0	(314)
mechanical ventilation - balanced, extract or positive input from outside [161.39] (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) = 161.39 (331) Energy for lighting (calculated in Appendix L) 361.13 (332) Total CO2 Emissions – Community heating scheme Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/kWh Emissions kg CO2/kwh 6 CO2/year 367a 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 fuel kg CO2/kwh 89.5 (367a) CO2 associated with heat source 1 (%) [(307b)+(310b)] x 100 + (367b) x 0.22 = 888.26 (367) Electrical energy for heat distribution [(313) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363(366) + (368)(372) 0 907.36 (376) CO2 associated with water from immersion heater or instantaneous heater (312) x	Space cooling (if there is a fixed cooling	g system, if not enter 0)	$=(107) \div (314)$	=		0	(315)
pump for solar water heating Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 161.39 (331) Energy for lighting (calculated in Appendix L) 361.13 (332) 12b. CO2 Emissions – Community heating scheme Energy kWh/year Emission factor kg CO2/kWh 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 fuel 89.5 (367a) CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22 = 888.26 (367) Electrical energy for heat distribution [(313) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363)(366) + (368)(372) = 907.36 (373) CO2 associated with space heating (secondary) (309) x 0 = 0 (374) CO2 associated with space heating (secondary) (309) x 0 = 0 (374) CO2 associated with space and water heating (373) + (374) + (375) = 907.36 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 83.76 (378) CO2 associated with electricity for lighting (332)) x 0.52 = 187.43 (379) Total CO2, kg/year sum of (376)(382) = 1178.55 (383)			side			161.39	(330a)
Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 161.39 (331) Energy for lighting (calculated in Appendix L) 361.13 (332) 12b. CO2 Emissions – Community heating scheme Energy kWh/year Emission factor kg CO2/kWh 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 fuel 89.5 (367a) CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22 = 888.26 (367) Electrical energy for heat distribution [(313) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363)(366) + (368)(372) = 907.36 (373) CO2 associated with space heating (secondary) (309) x 0 = 0 (374) CO2 associated with space heating (secondary) (309) x 0.52 = 0 (375) Total CO2 associated with space and water heating (373) + (374) + (375) = 907.36 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 83.76 (378) CO2 associated with electricity for lighting (332)) x 0.52 = 187.43 (379) Total CO2, kg/year sum of (376)(382) = 1178.55 (383)	warm air heating system fans					0	(330b)
Energy for lighting (calculated in Appendix L) 361.13 (332)	pump for solar water heating					0	(330g)
Energy Emission factor Emissions KWh/year kg CO2/kWh kg CO2/year	Total electricity for the above, kWh/yea	r	=(330a) + (330	b) + (330g) =	Ē	161.39	(331)
Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/kwh 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 fuel 89.5 (367a) CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22 = 888.26 (367) Electrical energy for heat distribution [(313) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363)(366) + (368)(372) = 907.36 (373) (373) CO2 associated with space heating (secondary) (309) x 0 = 0 (374) (374) CO2 associated with water from immersion heater or instantaneous heater (312) x 0.52 = 0 (375) (376) Total CO2 associated with space and water heating (373) + (374) + (375) = 907.36 (376) (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 83.76 (378) (378) CO2 associated with electricity for lighting (332))) x 0.52 = 187.43 (379) Total CO2, kg/year sum of (376)(382) = 1178.55 (383)	Energy for lighting (calculated in Apper	ndix L)			Ē	361.13	(332)
kWh/year kg CO2/kWh kg CO2/kwh kg CO2/kwh 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 fuel 89.5 (367a) CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22 = 888.26 (367) Electrical energy for heat distribution [(313) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363)(366) + (368)(372) = 907.36 (373) CO2 associated with space heating (secondary) (309) x 0 = 0 (374) CO2 associated with water from immersion heater or instantaneous heater (312) x 0.52 = 0 (375) Total CO2 associated with space and water heating (373) + (374) + (375) = 907.36 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 83.76 (378) CO2 associated with electricity for lighting (332)) x 0.52 = 187.43 (379) Total CO2, kg/year <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
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 fuel 89.5 (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times 0.22 = 888.26$ (367) Electrical energy for heat distribution $[(313) \times 0.52 = 19.1]$ (372) Total CO2 associated with community systems $(363)(366) \div (368)(372) = 907.36$ (373) CO2 associated with space heating (secondary) $(309) \times 0 = 0$ (374) CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.52 = 0$ (375) Total CO2 associated with space and water heating $(373) \div (374) \div (375) = 0.52 = 0.376$ (378) CO2 associated with electricity for pumps and fans within dwelling $(331)) \times 0.52 = 83.76$ (378) CO2 associated with electricity for lighting $(332)) \times 0.52 = 187.43$ (379) Total CO2, kg/year sum of $(376)(382) = 0.00$	12b. CO2 Emissions – Community hea	ting scheme					
Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 89.5 (367a) CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22 = 888.26 (367) Electrical energy for heat distribution [(313) x 0.52 = 19.1 (372) Total CO2 associated with community systems (363)(366) + (368)(372) = 907.36 (373) CO2 associated with space heating (secondary) (309) x 0 = 0 (374) CO2 associated with water from immersion heater or instantaneous heater (312) x 0.52 = 0 (375) Total CO2 associated with space and water heating (373) + (374) + (375) = 907.36 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 = 83.76 (378) CO2 associated with electricity for lighting (332))) x 0.52 = 187.43 (379) Total CO2, kg/year sum of (376)(382) = 1178.55 (383)	12b. CO2 Emissions – Community hea	Ü					
Electrical energy for heat distribution		- v					
Total CO2 associated with community systems $(363)(366) + (368)(372)$ = 907.36 (373) CO2 associated with space heating (secondary) $(309) \times 0$ = 0 (374) CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.52$ = 0 (375) Total CO2 associated with space and water heating $(373) + (374) + (375) =$ 907.36 (376) CO2 associated with electricity for pumps and fans within dwelling $(331)) \times 0.52$ = 83.76 (378) CO2 associated with electricity for lighting $(332)) \times 0.52$ = 187.43 (379) Total CO2, kg/year $(376)(382) =$ 1178.55 (383)	CO2 from other sources of space and v	water heating (not CHP)	kWh/year	kg CO2/kWh	kç	CO2/year	(367a)
CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous heater (312) x Total CO2 associated with space and water heating CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling (331)) x CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO3 associated with electricity for lighting CO2 associated with electricity for lighting CO3 associated with electricity for lighting	CO2 from other sources of space and vertice Efficiency of heat source 1 (%)	water heating (not CHP) If there is CHP using two	kWh/year fuels repeat (363) to	kg CO2/kWh	k ç d fuel	89.5	`` ¬
CO2 associated with water from immersion heater or instantaneous heater $(312) \times 0.52 = 0$ (375) Total CO2 associated with space and water heating $(373) + (374) + (375) = 0.52 = 0.00$ (376) CO2 associated with electricity for pumps and fans within dwelling $(331) \times 0.52 = 0.52 = 0.00$ (376) CO2 associated with electricity for lighting $(332) \times 0.52 = 0.52 = 0.00$ (378) Total CO2, kg/year $(376) \times (382) = 0.52 = 0.00$ (378)	CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	water heating (not CHP) If there is CHP using two [(307b)+(310b)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the secon	kç d fuel =	89.5 888.26	(367)
Total CO2 associated with space and water heating $(373) + (374) + (375) =$ CO2 associated with electricity for pumps and fans within dwelling (331)) x CO2 associated with electricity for lighting (332))) x (376) (378) (379) (379) (383)	CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	water heating (not CHP) If there is CHP using two [(307b)+(310b)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x) x	(366) for the secon 0.22 0.52	d fuel = =	89.5 888.26 19.1	(367)
CO2 associated with electricity for pumps and fans within dwelling (331)) x CO2 associated with electricity for lighting (332))) x Total CO2, kg/year Sum of (376)(382) = (378) 1178.55 (383)	CO2 from other sources of space and vertice of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) [(313) [(363)	fuels repeat (363) to b)] x 100 ÷ (367b) x) x(366) + (368)(372	(366) for the secon 0.22 0.52	kç d fuel = =	89.5 888.26 19.1 907.36	(367) (372) (373)
CO2 associated with electricity for lighting (332))) x 0.52 = 187.43 (379) Total CO2, kg/year sum of (376)(382) = 1178.55 (383)	CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) [(313) [(363) [(309)	fuels repeat (363) to (367b) x (366) + (368)(373)	(366) for the secon 0.22 0.52 0	kç d fuel = = = =	89.5 888.26 19.1 907.36	(367) (372) (373) (374)
Total CO2, kg/year sum of (376)(382) = 1178.55 (383)	CO2 from other sources of space and verificiency 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	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) [(313) [(363) [(309) [(fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(373) x heater (312) x	(366) for the secon 0.22 0.52 0	kç d fuel = = = =	89.5 888.26 19.1 907.36 0	(367) (372) (373) (374) (375)
10tal 002, kg/ycal	CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community of the commun	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) rsion heater or instantaneous water heating (373)	fuels repeat (363) to (a) x 100 ÷ (367b) x (b) x (c) x (c) x (c) x (d) x (e) x (e) x (f) x	kg CO2/kWh (366) for the secon 0.22 0.52 0 0.52	kç d fuel = = = = =	89.5 888.26 19.1 907.36 0	(367) (372) (373) (374) (375) (376)
Durolling CO2 Emission Rate (383) ÷ (4) =	CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community of the commun	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) rsion heater or instantaneous water heating (373) ups and fans within dwelling	fuels repeat (363) to o)] x 100 ÷ (367b) x) x (366) + (368)(373) x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the secon 0.22 0.52 0 0.52	kç d fuel = = = = = = =	89.5 888.26 19.1 907.36 0 907.36 83.76	(367) (372) (373) (374) (375) (376) (378)
Dwelling CO2 Emission Rate (383) ÷ (4) = 14.17 (384)	CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community of the community of the community of the community of the control	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) rsion heater or instantaneous water heating (373) ups and fans within dwelling ing (332)	fuels repeat (363) to o)] x 100 ÷ (367b) x) x (366) + (368)(373) x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the secon 0.22 0.52 0 0.52	kç d fuel = = = = = = =	89.5 888.26 19.1 907.36 0 0 907.36 83.76 187.43	(367) (372) (373) (374) (375) (376) (378) (379)

El rating (section 14)

(385)

87.68

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	— - 0 36FL	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.5.12	
A 1.1	į.	Property	Address	2_02 -	2B4P				
Address: 1. Overall dwelling dime	ensions:								
1. Overall aweiling aime	, , , , , , , , , , , , , , , , , , ,	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	220.48	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	83.2	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	220.48	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- +	0	j = F	0	x2	20 =	0	(6b)
Number of intermittent fa	ins			, <u> </u>	3	x ′	10 =	30	(7a)
Number of passive vents	3			F	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$			_ [30		÷ (5) =	0.14	(8)
Number of storeys in t	peen carried out or is intended, proced he dwelling (ns)	ed to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)
Additional infiltration	ine arraining (ine)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding t	o the grea	ter wall are	a (after					
deducting areas of openi	ngs);).1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(000	July, 5.55					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)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.39	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	ea		(20) = 1 -	0.075 x (1	19)] =			0.7	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		,,			0.27	(21)
Infiltration rate modified t			, , ,					0.21	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7	•	<u>. </u>		•	1		•	
$(22)m = \begin{bmatrix} 5.1 & 5 \end{bmatrix}$	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (20-) (2	2)m : 4							-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
(ΣΣα)ΠΤ 1.21 1.20	1.20 1.1 1.00 0.95	1 0.33	1 0.32		1.00	1.12	1.10	J	

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.34	2
Calculate effective air change rate for the applicable case	<u> </u>
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0 (23b)
	0 (23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) $(24a)m = (22b)m + (23b) \times [1 - (24a)m = 0 $	3c) ÷ 100] (24a)
	(244)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0	(24b)
	(240)
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
(24c)m =	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.56 0.56 0.55 0.54 0.54 0.53 0.53 0.53 0.54 0.54 0.55 0.5	5 (24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	<u> </u>
(25)m= 0.56 0.56 0.55 0.54 0.54 0.53 0.53 0.53 0.54 0.54 0.55 0.5	5 (25)
3. Heat losses and heat loss parameter:	
·	alue A X k
	n²-K kJ/K
Windows Type 1 1.65 $x^{1/[1/(1.4) + 0.04]} = 2.19$	(27)
Windows Type 2 $3.17 x^{1/[1/(1.4) + 0.04]} = 4.2$	(27)
Windows Type 3 7.29 $x^{1/[1/(1.4) + 0.04]} = 9.66$	(27)
Walls Type1 35 16.93 18.07 x 0.18 = 3.25	(29)
Walls Type2 15.4 0 15.4 x 0.18 = 2.77	(29)
Total area of elements, m ² 50.4	(31)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in parag	
** include the areas on both sides of internal walls and partitions	
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$	28.47 (33)
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e)	= 0 (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 1.	
· · ·	
can be used instead of a detailed calculation.	2.52 (36)
can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K	2.52 (36)
can be used instead of a detailed calculation.	2.52 (36) 30.99 (37)
can 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)	
can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) =	30.99 (37)
can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5)	30.99 (37)
can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D	30.99 (37)
Can 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) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D (38)m = 40.7 40.53 40.37 39.59 39.45 38.78 38.78 38.65 39.04 39.45 39.74 40.58	30.99 (37) 9C 5 (38)

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.86	0.86	0.86	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.85	0.85		
					Į.	Į.	Į.	,	Average =	Sum(40) ₁ .	12 /12=	0.85	(40)
Number of day	s in mo	nth (Tabl	le 1a)		·	·	ı			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 heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	nancy	N									<u></u>		(42)
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.		52		(42)
Annual averag											.07		(43)
Reduce the annua not more that 125							to achieve	a water us	se target o	f			
								_					
Jan	Feb	Mar	Apr	May	Jun	Jul Table 10 V	Aug	Sep	Oct	Nov	Dec		
Hot water usage in											1		
(44)m= 103.48	99.71	95.95	92.19	88.42	84.66	84.66	88.42	92.19	95.95	99.71	103.48		– ,
Energy content of	hot water	used - cal	culated mi	anthly – 4	190 x Vd r	пуптуГ	Tm / 3600			m(44) ₁₁₂ = ables 1b 1	L	1128.82	(44)
(45)m= 153.45	134.21	138.49	120.74	115.85	99.97	92.64	106.31	107.57	125.37	136.85	148.61	1 100 00	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar = Su	m(45) ₁₁₂ =	= [1480.06	(43)
(46)m= 23.02	20.13	20.77	18.11	17.38	15	13.9	15.95	16.14	18.81	20.53	22.29		(46)
Water storage		20.77	10.11	17.00	10	10.0	10.00	10.14	10.01	20.00	22.20		(10)
Storage volum	e (litres)	includin	g 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	velling, 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.	65		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	89		(50)
b) If manufact Hot water stora			-										(51)
If community h	•			C Z (KVVI	ii/iiti e/ae	(y)					0		(31)
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.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contains												ix H	, ,
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	e 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 month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0 0	Tor each	0	0	00) + 30	05 × (41)	0	0	0	0	0	1	(61)
	<u>ļ</u>							<u> </u>	<u> </u>	<u> </u>] · (59)m + (61)m	(01)
(62)m= 204.38	`	189.42	170.02	166.78	149.26	143.57	157.23	156.86	176.29	186.13	199.54	(59)111 + (61)111	(62)
Solar DHW input		l .		<u> </u>		<u> </u>						1	(02)
(add additiona									ii ooniiibai	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from v	vater hea	ıter		<u> </u>		<u> </u>	l	<u> </u>	<u>!</u>	ļ		ı	
(64)m= 204.38		189.42	170.02	166.78	149.26	143.57	157.23	156.86	176.29	186.13	199.54]	
						•	Out	put from w	ater heate	r (annual) ₁	12	2079.68	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 91.76	81.42	86.79	79.57	79.26	72.67	71.54	76.09	75.2	82.43	84.93	90.15	1	(65)
include (57)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	e Table 5	and 5a):									
Metabolic gains (Table 5), Watts													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-		•	
(67)m= 20.91	18.57	15.11	11.44	8.55	7.22	7.8	10.14	13.61	17.28	20.16	21.49]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	_	-	•	
(68)m= 226	228.34	222.43	209.85	193.97	179.05	169.07	166.73	172.64	185.22	201.1	216.03		(68)
Cooking gains	s (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5	-	-	•	
(69)m= 35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6]	(69)
Pumps and fa	ans gains	(Table 5	āa)									_	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	on (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83		(71)
Water heating	g gains (1	Table 5)										_	
(72)m= 123.34	121.16	116.65	110.52	106.54	100.93	96.16	102.27	104.44	110.79	117.96	121.17]	(72)
Total interna	l gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m 	_	
(73)m= 434.06	431.89	418	395.62	372.87	351	336.84	342.94	354.49	377.09	403.03	422.51		(73)
6. Solar gair													
Solar gains are		ŭ					itions to c		ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a	7	g_ able 6b	т	FF able 6c		Gains (W)	
							, —				_		1,
Northeast 0.9x	0.54		3.1			11.28	X	0.63	×	0.7	_ =	15.33	(75)
Northeast 0.9x			7.2			11.28	X	0.63		0.7	_ =	17.63	(75)
Northeast 0.9x	0.0 .	_	3.1			22.97	X	0.63		0.7	_ =	31.21	(75)
Northeast 0.9x		_	7.2		-	22.97	X	0.63		0.7	=	35.88	(75)
Northeast 0.9x	0.54	X	3.1	7	X	11.38	X	0.63	x	0.7	=	56.23	(75)

Northeast 0.98	Northeast _{0.9x}	0.54	×	7 '	29	x	1	1.38] x		0.63	7 x	0.7		\Box	64.65	(75)
Northeast 0.9x	<u> </u>		_						1			╡╏		=	⊨		=
Northeast 0.9x	<u>L</u>] 1			╡		=	\vdash		╡` ′
Northeast 0.9x	Northeast _{0.9x}		×			x]] x			ا × ا		╡ -	H		= ` '
Northeast 0.9x	Northeast _{0.9x}		×			x)] x			×	0.7	╡ -	F		(75)
Northeast 0.0x	Northeast _{0.9x}		x			x	_) x		0.63	×	0.7	_ =			(75)
Northeast 0.9x	Northeast 0.9x	0.54	x			x	9	7.38) x		0.63	×	0.7				(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	×	3.	17	x		91.1	X		0.63	×	0.7	-	F	123.79	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	x	7.2	29	x	9	91.1	x		0.63	×	0.7	╡ -		142.34	(75)
Northeast 0.9x	Northeast 0.9x	0.54	x	3.	17	x	7	2.63	x		0.63	x	0.7	_ =		98.69	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	x	7.2	29	x	7	2.63	x		0.63	x	0.7		F	113.47	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	3.	17	x	5	0.42	x		0.63	x	0.7		Ī	68.51	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	5	0.42	x		0.63	x	0.7	<u> </u>	F	78.78	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	3.	17	x	2	8.07	x		0.63	x	0.7	<u> </u>	Ī	38.14	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	2	8.07	x		0.63	x	0.7	<u> </u>		43.85	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	3.	17	x	1	14.2	x		0.63	x	0.7	<u> </u>	T	19.29	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	1	14.2	x		0.63	x	0.7	-		22.18	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	X	3.	17	x	9	9.21	x		0.63	x	0.7			12.52	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	9	9.21	x		0.63	x	0.7			14.4	(75)
Southeast 0,9x	Southeast 0.9x	0.54	x	1.6	65	x	3	6.79	x		0.63	x	0.7	=		26.02	(77)
Southeast 0.9x	Southeast 0.9x	0.54	x	1.6	65	x	6	2.67	X		0.63	x	0.7	=		44.33	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	8	5.75	x		0.63	x	0.7	=		60.65	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	10	06.25	x		0.63	x	0.7	=		75.15	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	11	19.01	X		0.63	x	0.7	=		84.17	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	11	18.15	X		0.63	x	0.7	=		83.56	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	11	13.91	X		0.63	x	0.7	=		80.57	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	10	04.39	X		0.63	x	0.7	=		73.83	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	9	2.85	X		0.63	x	0.7	=		65.67	(77)
Southeast 0.9x 0.54 x 1.65 x 31.49 x 0.63 x 0.7 = 22.27 (77) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Southeast 0.9x	0.54	X	1.6	65	x	6	9.27	X		0.63	x	0.7	=		48.99	(77)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m 1	Southeast 0.9x	0.54	X	1.6	65	x	4	4.07	X		0.63	x	0.7	=		31.17	(77)
(83)m= 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Southeast 0.9x	0.54	Х	1.6	65	x	3	1.49	X		0.63	x	0.7	=		22.27	(77)
(83)m= 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)																	
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	1			1						\neg			1		_		(00)
(84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)									28	6	212.96	130.98	72.64	49.19			(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		-		· · ·		_			620	04	567.46	509 O	175.67	471.60	П		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	` ′						19.05	003.34	020	.94	307.40	506.00	475.67	471.09			(04)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				`				Tab	-1- 0	TL 2	L (0 0)				_		7(05)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	•	_	٠.			_			oie 9	, ih'	i (°C)				L	21	(85)
(86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		Ť				Ť				<u>.</u> T	S02	Oat	Nov	Doo	٦		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)				<u> </u>		+			_				+	-	\dashv		(86)
		<u> </u>			<u> </u>						!	0.91	1 '	L'			(30)
(01)111= 20.10 20.21 20.41 20.14 20.93 20.99 21 21 20.90 20.11 20.39 20.14					1	`						20.74	20.20	20.44	٦		(87)
	(07)111= 20.16	20.27	∠∪.4/	20.74	20.93		20.99	21	1 2	<u>'</u>	∠∪.96	∠0./1	20.39	20.14			(01)

T		المارية				ali i i a III a ai	. f T.	.b.a. T	LO (0 0)					
· · · · · ·			eating p				1	i	· ` ´	20.24	20.24	20.24		(88)
(88)m=	20.2	20.2	20.2	20.21	20.21	20.22	20.22	20.22	20.22	20.21	20.21	20.21		(00)
г	tion fac	<u>_</u>	ains for i			```		9a)				· · · · · ·		
(89)m=	1	0.99	0.98	0.93	0.77	0.54	0.37	0.42	0.72	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)				
(90)m=	19.07	19.23	19.52	19.9	20.14	20.21	20.22	20.22	20.18	19.88	19.41	19.04		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.54	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.66	19.8	20.04	20.35	20.57	20.63	20.64	20.64	20.6	20.33	19.94	19.63		(92)
Apply	adjustn	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.66	19.8	20.04	20.35	20.57	20.63	20.64	20.64	20.6	20.33	19.94	19.63		(93)
8. Spa	ace hea	ting requ	uirement											
				•		ed at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
tne uti		Feb	or gains Mar			ميرا	Jul	۸۰۰۰	Con	Oct	Nov	Doo		
_ L Itilica:	Jan		ains, hm	Apr	May	Jun	Jui	Aug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.98	0.93	0.79	0.58	0.41	0.47	0.76	0.96	0.99	1		(94)
L	•		, W = (9 ⁴			0.00]	J	00	0.00	0.00			(- /
	491.41	539.68	588.45	624.26	575.15	415.56	281.42	294.21	428.7	486.84	472.14	470.5		(95)
` ' L		age exte	rnal tem	perature	from Ta	ı able 8		<u> </u>	<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 lo	oss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1101.07	1065.35	965.95	808.45	624.53	420.98	281.94	295.34	455.3	685.35	908.4	1096.45		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	453.58	353.25	280.86	132.62	36.74	0	0	0	0	147.69	314.1	465.71		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2184.56	(98)
Space	heatin	g require	ement in	kWh/m²	/year								26.26	(99)
9a. Ene	ergy rec	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatir	ng:												
Fraction	on of sp	ace hea	at from se	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)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ncy of ı	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ncy of	seconda	ry/supple	ementar	y heatin	g systen	า, %						0	(208)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊸ ear
Space	heatin	g require	ement (c		d above)							•	
	453.58	353.25	280.86	132.62	36.74	0	0	0	0	147.69	314.1	465.71		
(211)m	= {[(98)m x (20	(4)] } x 1	00 ÷ (20	16)									(211)
	485.11	377.81	300.38	141.84	39.29	0	0	0	0	157.96	335.94	498.09		
_				•		•	•	Tota	I (kWh/yea	ar) =Sum(2	211),15,1012	F	2336.42	(211)
		a fuel (s	econdar	y), kWh/	month							!		_
Space	heatin	9 . 5. 5. (5		. , .										
•		•	00 ÷ (20	• , .				r		i		· · · · · ·		
•		•		• , .	0	0	0	0	0	0	0	0		_
= {[(98)	m x (20)1)] } x 1	00 ÷ (20	8)		0	0		0 Il (kWh/yea				0	(215)

Water heating								
Output from water heater (calculated above) 204.38 180.21 189.42 170.02 166.78 1	149.26 143.57	157.23	156.86	176.29	186.13	199.54]	
Efficiency of water heater						!	79.8	(216)
(217)m= 86.88 86.58 85.86 84.16 81.54	79.8 79.8	79.8	79.8	84.35	86.2	87		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•					•	•	
· ' · · · · · · · · · · · · · · · · ·	187.04 179.91	197.03	196.56	209.01	215.93	229.35		_
		Total	= Sum(2	19a) ₁₁₂ =			2485.38	(219)
Annual totals				k'	Wh/yeaı	•	kWh/year	7
Space heating fuel used, main system 1							2336.42	_
Water heating fuel used							2485.38	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							369.33	(232)
12a. CO2 emissions – Individual heating system	ns including mi	cro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	504.67	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	536.84	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1041.51	(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	=	191.68	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1272.12	(272)

TER =

(273)

15.29

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:10

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76m2

Site Reference: **Tottenham Mews** Plot Reference: 2_03 - 2B4P

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 16.31 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.38 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.4 kWh/m²

OK

OK

2 Fabric U-values

Element Average Highest External wall 0.19 (max. 0.30) 0.20 (max. 0.70)

Floor (no floor) Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ОК
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	OK
MVHR efficiency:	78%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
sased on:		
Overshading:	Average or unknown	
Windows facing: North East	12.68m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or rolle	r blind
	Closed 100% of daylight hou	rs
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from boilers – mains gas		

		l Iser-I	Details:						
Assessor Name:	Vitaliy Troyan	USGI^L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	į	Property	Address	2_03 -	2B4P				
Address: 1. Overall dwelling dime	pnoiono:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Ground floor				(1a) x		2.65	(2a) =	201.4	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	76	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	201.4	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	_ + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins			Γ	0	x '	10 =	0	(7a)
Number of passive vents	3			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_			A in a b	anges ner h	
	ve flues and force (60) (6b) (7a) ı (7b) ı	(70) -	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		(//				,		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	1.25 for steel or timber frame or resent, use the value corresponding to the corresponding			•	ruction			0	(11)
deducting areas of openi		o ine grea	ter wan are	a (anter					
•	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es per ho					area	3	(17)
,	lity value, then $(18) = [(17) \div 20] +$	•	•	•		о.оро	u. • u	0.15	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere	ed		(20) 4	10 07E v (4	10)1			4	(19)
Shelter factor	ting aboltor factor		(20) = 1 - (21) = (18)		19)] =			0.7	(20)
Infiltration rate incorpora			(21) = (10) X (20) =				0.1	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		1 00	1 7.59			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]	
Wind Foster (00s) : (2	2)		•		•	•		•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32	'	1.00	1.12	1.10	J	

0.13	ation rate	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effe		•	ate for t	he appli	cable ca	se	ļ				ļ	I	
If mechanica				(22			.=	. (22)	\ (00 \			0.5	(23
If exhaust air h) = (23a)			0.5	(23
If balanced with		•	•	ŭ		,						66.3	(2:
a) If balance						<u> </u>		<u> </u>			` ` ´	÷ 100] I	(0
24a)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(2
b) If balance						· ·	- ^ ` `	, ,	r i	•		1	(0
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (22h	`			
	n < 0.5 × ((23b), ti	nen (240	0 = (230	o); otnerv	vise (24)	C) = (220)	0) m + 0.	5 × (230	0	0]	(2
									U		U		(2
d) If natural if (22b)n	ventilation n = 1, ther			•	•				0.5]				
24d)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)			ļ.	l	
25)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(2
3. Heat losse	_	·			NI-1 A-		11 -1	_	A 37 11		1 -1		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
LEMENT	Gross area (r		Openin m	=	Net Ar A ,n		U-valı W/m2		A X U (W/ł	()	k-value kJ/m²-l		XXk J/K
Vindows		,			3.17		/[1/(1.1)+		3.34	<u></u>			(2
Valls Type1	36.3	\neg	12.68	$\overline{}$	23.62	=	0.2		4.72	=) (2
Valls Type2	24.1	=	0		24.1	X	0.19	<u> </u>	4.46	=		╡┝	` (2
otal area of e		 m²			60.4	╡ ^	0.19		4.40				\^2 (3
for windows and	•		ffective wi	ndow I I-va		 ated usino	ı formula 1	/[(1/ -valı	ıe)±0 041 a	s aiven in	naragranh	1 3 2	(-
include the area						atou uomg	Torrida 1	I(I/O Valo	10) 10.0 1 ₁ u	o givoii iii	paragrapi	10.2	
abric heat los	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				22.55	(3
leat capacity	Cm = S(A)	xk)							(30) + (32)	!) + (32a).	(32e) =	0	(3
. ,								((28)	(00) 1 (02	, , ,			100
	paramete	r (TMF	e Cm ÷	- TFA) in	ı kJ/m²K			** **	tive Value:	, , ,		100	=
hermal mass for design assess	sments where	e the det	tails of the	,			ecisely the	Indica	tive Value:	Low	able 1f	100	=
Thermal mass for design assess an be used inste	sments where ad of a detail	re the det iled calcu	tails of the ılation.	constructi	ion are not	known pr	ecisely the	Indica	tive Value:	Low	able 1f		(3
Thermal mass for design assess an be used inste Thermal bridge	sments where ad of a detail es : S (L x	re the det iled calcu Y) calc	tails of the ilation. culated t	constructi	on are not pendix l	known pr	ecisely the	Indica	tive Value:	Low	able 1f	9.06	(3
Thermal mass for design assess an be used inste Thermal bridge details of therma	sments where had of a detail had : S (L x had bridging ar	re the det iled calcu Y) calc	tails of the ilation. culated t	constructi	on are not pendix l	known pr	ecisely the	Indica indicative	tive Value:	Low	able 1f	9.06	(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal Total fabric he	sments when ad of a detail es: S (L x al bridging ar at loss	re the det iled calcu Y) calcure re not kno	tails of the ulation. culated u	constructiusing Ap	on are not pendix l	known pr	ecisely the	Indicative (33) +	tive Value: e values of (36) =	Low TMP in Ta			(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal fotal fabric hermal details of thermal fotal fabric hermal design and the second design as the	sments when ead of a detail es: S (L x al bridging ar eat loss at loss cald	re the det iled calcu Y) calcu re not kno	tails of the ulation. culated u own (36) = monthly	constructi	on are not pendix h	known pr	,	Indicative (33) + (38)m	tive Value: e values of (36) = = 0.33 × (30)	Low TMP in Ta		9.06	(3
hermal mass or design assess an be used inste hermal bridge details of thermal otal fabric hermal fa	sments when add of a detail es: S (L x all bridging areat loss at loss call	re the det iled calcu Y) calcu re not kno culated Mar	tails of the ulation. culated u own (36) = monthly	constructions constructions constructions constructions constructions constructed constructions cons	pendix h	known pr	Aug	Indicative (33) + (38)m Sep	(36) = = 0.33 × (30)	Low TMP in Te		9.06	
Thermal mass for design assess an be used inste Thermal bridge details of thermal total fabric here. The details of the detail	esments when ad of a detail es : S (L x al bridging are at loss at loss calc	re the det illed calcu Y) calcu re not know culated Mar	tails of the ulation. culated u own (36) = monthly	constructi	on are not pendix h	known pr	,	Indicative (33) + (38)m Sep 18.18	(36) = = 0.33 × (2) Oct 18.7	Low TMP in Ta 25)m x (5) Nov 19.05	Dec	9.06	(3
Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric hermal dentilation head as many series and the details of the det	esments when and of a detail. es: S (L x all bridging are at loss calcombined by the second by the s	re the det illed calcu Y) calcu re not kno culated Mar 19.75	tails of the ulation. culated to own (36) = monthly Apr 18.88	constructions constructions constructions constructions constructed constructed constructions constructed constructions constructed constructions constructed constructions constructed constructed constructions constructed constructions constructed constructed constructions constructed co	pendix k Jun 17.83	Jul	Aug 17.65	(33) + (38)m Sep 18.18 (39)m	(36) = = 0.33 × (37) = (37) + (37)	Low TMP in Ta 25)m x (5) Nov 19.05 88)m	Dec 19.4	9.06	(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal fotal fabric he Ventilation hea	esments when and of a detail. es: S (L x all bridging are at loss calcombined by the second by the s	re the det illed calcu Y) calcu re not know culated Mar	tails of the ulation. culated u own (36) = monthly	constructions constructions constructions constructions constructions constructed constructions cons	pendix h	known pr	Aug	(33) + (38)m Sep 18.18 (39)m 49.78	(36) = = 0.33 × (37) +	25)m x (5) Nov 19.05 88)m 50.66	Dec 19.4 51.01	9.06	(3
Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric hermal details of thermal fotal fabric hermal details of thermal fabric hermal design and the design and the design and the design as t	sments when ad of a detail es: S (L x al bridging are eat loss cald Feb 19.92 coefficient,	the the detailed calculated Mar 19.75 , W/K 51.35	tails of the ulation. culated to own (36) = monthly Apr 18.88	constructions constructions constructions constructions constructed constructed constructions constructed constructions constructed constructions constructed constructions constructed constructed constructions constructed constructions constructed constructed constructions constructed co	pendix k Jun 17.83	Jul	Aug 17.65	(33) + (38)m Sep 18.18 (39)m 49.78	(36) = = 0.33 × (37) = (37) + (37)	25)m x (5) Nov 19.05 88)m 50.66 Sum(39) ₁ .	Dec 19.4 51.01	9.06	(3
Thermal mass for design assess an be used instead of thermal bridge details of thermal fotal fabric hermal details of thermal fotal fabric hermal details of thermal fotal fabric hermal design and the details of the d	sments when ad of a detail es: S (L x al bridging are eat loss cald Feb 19.92 coefficient,	the the detailed calculated Mar 19.75 , W/K 51.35	tails of the ulation. culated to own (36) = monthly Apr 18.88	constructions constructions constructions constructions constructed constructed constructions constructed constructions constructed constructions constructed constructions constructed constructed constructions constructed constructions constructed constructed constructions constructed co	pendix k Jun 17.83	Jul	Aug 17.65	(33) + (38)m Sep 18.18 (39)m 49.78	(36) = = 0.33 × (2) Oct 18.7 = (37) + (3) 50.31 Average =	25)m x (5) Nov 19.05 88)m 50.66 Sum(39) ₁ .	Dec 19.4 51.01	9.06	(3)

Number of days in month (Table 1a)

Numbe	er of day	's in moi	ntn (Tab	ie 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)
			<u> </u>	<u> </u>							<u>. </u>			
1 \\/-	tor boot	ing once	ray roqui	iromont:								kWh/ye	oor:	
4. ۷۷	ilei ileai	ing ener	rgy requi	nement.								KVVII/yt	sai.	
Assum	ed occu	pancy, I	N								2.	38		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
	A £ 13.9	•				\ / al		(OF v. NI)	. 20				I	(15)
								(25 x N) to achieve		se target o		.79		(43)
		-	person pei			-	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			l	<u> </u>		l	Table 1c x		Сор	00.	1101	200		
(44)m=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87		
(11)	00.07	00.20	02.0	00.07	00.01	1 0	01	1 00.01	l		m(44) ₁₁₂ =		1089.44	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x E	OTm / 3600			ables 1b, 1		1000.44	
(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42		
(10)=	1 10.1	120.00	100.00	110.00	111.01	00.10	00.11	102.0			m(45) ₁₁₂ =		1428.42	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		rotar – oa	111(40)112 -	ļ	1420.42	
(46)m=	22.21	19.43	20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51		(46)
, ,	storage		20.00	17.10	10.77	L	10.11	10.00	10.07	10.10	10.01	21.01		(- /
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If com	munity h	eating a	nd no ta	ınk in dw	velling, e	nter 110) litres in	(47)						
Otherv	vise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	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 (kWl	n/day):				2.	24		(48)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1.	34		(50)
b) If m	nanufact	urer's de	eclared o	cylinder l	loss fact	or is not	known:							
		-	factor fr		le 2 (kW	h/litre/da	ay))		(51)
	•	_	ee secti	on 4.3									•	
	e factor			Oh)		(52)
-			m Table)		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =)		(54)
	(50) or (, ,	,								1.	34		(55)
Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Drimon	oirouit	loop (on	hanal\ fra	m Table)		(58)
	•	•	nual) fro			50\m - /	(58) · 36	65 × (41)	m			<u> </u>	l	(00)
	-					•	. ,	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)
				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>						\ -/
			i		ì	ì ´	65 × (41	<u></u>					1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for w	ater he	ating ca	alculated	l for e	ach month	(62)	m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
	198.59	179.36	176.74	159.3		167		166.65	185.92	194.91	208.35		(62)
Solar DHW input calculated us	ing Appe	endix G or	Appendix	H (neg	ative quantity	y) (ent	er '0'	if no solar	r contribu	tion to wate	er heating)		
(add additional lines if FO	GHRS a	and/or V	VWHRS	appli	es, see Ap	pend	lix G	S)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0		(63)
Output from water heate	r						•			•		•	
(64)m= 213.02 188.17 1	198.59	179.36	176.74	159.3	2 154.33	167	.52	166.65	185.92	194.91	208.35		
	•	-			•	•	Outp	ut from wa	ater heate	er (annual) ₁	12	2192.88	(64)
Heat gains from water he	eating,	kWh/mo	onth 0.2	5 ′ [0.	35 × (45)m	+ (6	1)m] + 0.8 x	: [(46)m	+ (57)m	+ (59)m]	
(65)m= 101.18 89.98	96.38	89.01	89.12	82.3	81.67	86.	05	84.79	92.17	94.18	99.63		(65)
include (57)m in calcul	lation o	f (65)m	only if c	ylinde	r is in the	dwell	ing (or hot w	ater is f	rom com	munity h	leating	
5. Internal gains (see T	able 5	and 5a)):										
Metabolic gains (Table 5	i). Watt	S											
Jan Feb	Mar	Apr	May	Jui	n Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 119.13 119.13 1	119.13	119.13	119.13	119.1	3 119.13	119	.13	119.13	119.13	119.13	119.13		(66)
Lighting gains (calculated	d in Ap	pendix I	_, equat	ion L9	or L9a), a	lso s	ee T	Table 5		•		•	
(67)m= 19.77 17.56	14.28	10.81	8.08	6.82	7.37	9.5	8	12.86	16.33	19.06	20.32		(67)
Appliances gains (calcula	ated in	Append	lix L, eq	uation	L13 or L1	3a), a	also	see Tal	ole 5	1	ı		
	207.55	195.81	180.99	167.0		155		161.09	172.83	187.65	201.57		(68)
Cooking gains (calculate	d in Ap	pendix	L, equat	ion L	5 or L15a), als	o se	e Table	5	<u> </u>			
	34.91	34.91	34.91	34.9		34.		34.91	34.91	34.91	34.91		(69)
Pumps and fans gains (7	Table 5	 a)						<u> </u>		1	<u>I</u>	ı	
(70)m = 0 0	0	0	0	0	0	0)	0	0	0	0		(70)
Losses e.g. evaporation	(negati	ive valu	es) (Tab	le 5)		1				1	l .	ı	
	-95.3	-95.3	-95.3	-95.3	-95.3	-95	5.3	-95.3	-95.3	-95.3	-95.3		(71)
Water heating gains (Tal	ble 5)									1	ļ	ı	
(72)m= 136 133.9 1		123.63	119.78	114.3	7 109.77	115	.66	117.76	123.89	130.81	133.91		(72)
Total internal gains =	<u>!</u>				66)m + (67)m	1 + (68	3)m +	· (69)m + (70)m + (71)m + (72)	m	ı	
	410.12	388.99	367.6	347	333.64	339	.56	350.45	371.78	396.25	414.54		(73)
6. Solar gains:													
Solar gains are calculated usi	ing solar	flux from	Table 6a	and ass	ociated equa	tions	to co	nvert to th	e applica	ble orientat	ion.		
Orientation: Access Fac	ctor	Area			·lux			g_		FF		Gains	
Table 6d		m²			able 6a		Ta	able 6b	٦	able 6c		(W)	
Northeast 0.9x 0.54	X	3.1	7	x	11.28	x		0.44	x	0.8	=	24.47	(75)
Northeast _{0.9x} 0.54	X	3.1	7	x	22.97	X		0.44	x	0.8	=	49.82	(75)
Northeast _{0.9x} 0.54	X	3.1	7	x	41.38	x		0.44	x [0.8	=	89.76	(75)
Northeast _{0.9x} 0.54	X	3.1	7	x	67.96	x		0.44	x	0.8	=	147.41	(75)
Northeast 0.9x 0.54	X	3.1	7	x	91.35	x		0.44	X	0.8	=	198.15	(75)
Northeast _{0.9x} 0.54	х	3.1	7	x	97.38	x		0.44	x	0.8	=	211.25	(75)
Northeast _{0.9x} 0.54	х	3.1	7	x	91.1	x		0.44	x	0.8	=	197.62	(75)
Northeast _{0.9x} 0.54	X	3.1	7	x	72.63	x		0.44	x	0.8	=	157.54	(75)

Northea	st _{0.9x}	0.54	X	3.1	7	x	50.42	x	0.44	x	0.8	=	109.37	(75)
Northea	st _{0.9x}	0.54	х	3.1	7	x	28.07	x	0.44	х	0.8	=	60.88	(75)
Northea	st _{0.9x}	0.54	x	3.1	7	x	14.2	X	0.44	х	0.8	=	30.8	(75)
Northea	st _{0.9x}	0.54	×	3.1	7	x	9.21	x	0.44	_ x [0.8	_ =	19.99	(75)
	_					_								_
Solar g	ains in	watts, ca	alculated	for eacl	h month			(83)m = 3	Sum(74)m .	(82)m				
(83)m=	24.47	49.82	89.76	147.41	198.15	211.	25 197.62	157.54	109.37	60.88	30.8	19.99		(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	+ (83)	m , watts				!		1	
(84)m=	449.86	473.08	499.87	536.4	565.74	558.	24 531.26	497.1	459.82	432.66	427.04	434.53		(84)
7. Mea	an inter	nal temp	erature ((heating	season)								
				`			ea from Tal	ole 9. Ti	ո1 (°C)				21	(85)
•		_	•			-	Table 9a)	, , ,	(-)					`` ′
]	Jan	Feb	Mar	Apr	May	Ju		Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.96	0.94	0.91	0.84	0.71	0.54		0.44	0.67	0.86	0.93	0.96	1	(86)
` ′ L								<u> </u>	ļ				I	` '
Г							steps 3 to 7			l	l		1	(07)
(87)m=	19.78	19.92	20.19	20.55	20.81	20.9	20.99	20.98	20.89	20.57	20.14	19.76	J	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwell	ing from Ta	ble 9, 7	h2 (°C)	_		_	_	
(88)m=	20.36	20.36	20.36	20.37	20.37	20.3	38 20.38	20.39	20.38	20.37	20.37	20.37		(88)
Utilisa	tion fac	tor for g	ains for r	est of d	welling,	n2,m	(see Table	9a)						
(89)m=	0.95	0.94	0.9	0.82	0.68	0.49	<u>` </u>	0.39	0.62	0.84	0.93	0.96]	(89)
Mean	interna	l tompor	ature in t	ho roct	of dwalli	na Tí	2 (follow ste	ne 3 to	7 in Tabl	lo ()c)			ı	
(90)m=	18.7	18.9	19.29	19.8	20.16	20.3	<u> </u>	20.37	20.27	19.84	19.23	18.68	1	(90)
(00)			10.20				20.00				g area ÷ (4		0.57	(91)
												,	0.07	
Г							= fLA × T1				T		1	(00)
(92)m=	19.32	19.49	19.8	20.22	20.53	20.6		20.72	20.63	20.26	19.75	19.3	J	(92)
г			T T		· ·		from Table	i	 	·	T 40.75	1,00	1	(02)
(93)m=	19.32	19.49	19.8	20.22	20.53	20.6	9 20.73	20.72	20.63	20.26	19.75	19.3		(93)
		Ĭ.	uirement				-1441	Table 6	N	. T' /	70)	1		
			ernai ten or gains t			ed at	step 11 of	rables	ob, so tha	it 11,m=(76)m an	a re-caid	culate	
σ σ	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec	1	
L Utilisa			ains, hm	•	may	- Gu	••		1 000		1101		ı	
(94)m=	0.94	0.93	0.89	0.82	0.69	0.5	1 0.38	0.42	0.64	0.83	0.92	0.95	1	(94)
Useful	gains,	hmGm .	W = (94	m x (84	4)m		<u> </u>	l	!	!	!	ļ	ı	
(95)m=	423.01	438	445.91	437.47	388.81	287.	47 200.75	208.17	293.82	361.2	391.12	410.94]	(95)
Month	ly avera	age exte	rnal tem	perature	from Ta	able 8	3	ļ		!		ļ.	ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	6 16.6	16.4	14.1	10.6	7.1	4.2	1	(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	Lm , ۱	W =[(39)m	x [(93)n	n– (96)m]			1	
(97)m=	776.55	751.6	683.14	571.68	444.34	301.0	04 203.94	212.86	324.84	485.89	640.65	769.96		(97)
Space	heatin	g require	ement for	r each n	nonth, k\	/Vh/m	onth = 0.02	24 x [(97	7)m – (95)m] x (4	1)m	•	•	
(98)m=	263.03	210.74	176.5	96.64	41.32	0	0	0	0	92.77	179.66	267.11		
_								Tot	al per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1327.76	(98)
Space	heatin	a reauire	ement in	kWh/m²	?/vear								17.47	(99)
.,		J 1,5		, ·	,									」 ` ′

9b. Energy requirements – Community heating scheme											
This part is used for space heating, space cooling or wat Fraction of space heat from secondary/supplementary he		mmunity scheme.	0	(301)							
Fraction of space heat from community system 1 – (301)	=	<u> </u>	1	(302)							
The community scheme may obtain heat from several sources. The pre- includes boilers, heat pumps, geothermal and waste heat from power s		L four other heat sources; th	e 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	g system		1.05	(306)							
Space heating Annual space heating requirement		ſ	kWh/yea 1327.76	r 							
Space heat from Community boilers	x (305) x (306) =	1394.15	(307a)								
Efficiency of secondary/supplementary heating system in	Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)										
Space heating requirement from secondary/supplementa	0	(309)									
Water heating Annual water heating requirement	2192.88	_ ¬									
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	L < (305) x (306) =	2302.52								
Electricity used for heat distribution		7e) + (310a)(310e)] =	36.97	(313)							
Cooling System Energy Efficiency Ratio		, , , , , , , , , , , , , , , , , , ,	0	(314)							
Space cooling (if there is a fixed cooling system, if not en	eter 0) = (107) ÷ (314) =	0	(315)							
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	·	Γ	147.42	(330a)							
warm air heating system fans		<u> </u>	0	(330b)							
pump for solar water heating		<u> </u>	0	(330g)							
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	147.42	(331)							
Energy for lighting (calculated in Appendix L)		Ī	349.1	(332)							
12b. CO2 Emissions – Community heating scheme											
	Energy kWh/year	Emission factor E kg CO2/kWh	Emissions cg CO2/year								
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)	CHP) tHP using two fuels repeat (363) to	o (366) for the second fuel	89.5	(367a)							
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	892.16	(367)							
Electrical energy for heat distribution	[(313) x	0.52	19.19	(372)							
Total CO2 associated with community systems	(363)(366) + (368)(37	72) =	911.34	(373)							
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)							
CO2 associated with water from immersion heater or inst	tantaneous heater (312) x	0.52	0	(375)							
Total CO2 associated with space and water heating	911.34	(376)									

CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 76.51 0.52 CO2 associated with electricity for lighting (379) (332))) x 0.52 181.18 Total CO2, kg/year sum of (376)...(382) = 1169.04 (383) **Dwelling CO2 Emission Rate** $(383) \div (4) =$ 15.38 (384)El rating (section 14) (385) 87.05

			User D	otoile:								
) (1) T		USELL					OTDO	040000			
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 201	12		Strom: Softwa					018096 on: 1.0.5.12			
Software Name.	Stroma i SAI 20		operty .	Address				VCISIC	71. 1.0.3.12			
Address :												
1. Overall dwelling dime	ensions:											
Ground floor			Area	a(m²)	(4=)		ight(m)	7(0-)	Volume(m ³	<u>^</u>		
	\				(1a) x	2	.65	(2a) =	201.4	(3a)		
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n))	76	(4)					_		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	201.4	(5)		
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır		
N. selven of all leaves a	heating	neating	, –		, –			40		_		
Number of chimneys	0 +	0]	0] = [0		40 =	0	(6a)		
Number of open flues	0 +	0] + L	0] = [0		20 =	0	(6b)		
Number of intermittent fa					L	3	X '	10 =	30	(7a)		
Number of passive vents	;				L	0	X '	10 =	0	(7b)		
Number of flueless gas fi	Number of flueless gas fires 0 x 40 =											
								Air ch	nanges per ho	our		
Infiltration due to chimne	ovs flues and fans = (6	Sa)+(6b)+(7a	a)+(7b)+(7c) =	Г	30		÷ (5) =	0.15	(8)		
If a pressurisation test has b	•				ontinue fr			- (0) =	0.15	(0)		
Number of storeys in the	he dwelling (ns)								0	(9)		
Additional infiltration							[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0	0.25 for steel or timber present, use the value corres				•	ruction			0	(11)		
deducting areas of openi		sponding to	uie great	er wan are	a (anter							
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.1	1 (seale	ed), else	enter 0				0	(12)		
If no draught lobby, en									0	(13)		
Percentage of window	s and doors draught s	tripped							0	(14)		
Window infiltration				0.25 - [0.2	, ,	_	. (45)		0	(15)		
Infiltration rate	250 summara dia sul	-:		(8) + (10)	, , ,	, , ,	, ,		0	(16)		
Air permeability value, If based on air permeabil	•		•	•	•	etre or e	rivelope	area	5	(17)		
Air permeability value applie	-					is beina u	sed		0.4	(18)		
Number of sides sheltere				, ,	,	3			4	(19)		
Shelter factor				(20) = 1 -	0.075 x (1	l9)] =			0.7	(20)		
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.28	(21)		
Infiltration rate modified f	or monthly wind speed	d							_			
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				
							-		ı			

Adjusted infiltr	ation rat	e (allowi	ng for sh	ielter an	d wind s	peed) =	(21a) x	(22a)m					
0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.31	0.33		
Calculate effe		-	rate for t	he appli	cable ca	se					•	·	
If mechanic			andiv N. (2	2h) _ (22a) v Emy (c	austion (N	JEN othou	ruino (22h	n) - (22a)			0	(23
If exhaust air h		0 11		, ,	,	. `	,, .	`	o) = (23a)			0	(23
If balanced with		•	•	Ū		,	•		OL) (4		. (22.)	0	(23
a) If balance	1					<u> </u>	- 	<u> </u>	 		- ` 	÷ 100] I	(0.4
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance							<u> </u>		r ´ `			1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				5 (00)	`			
	n < 0.5 ×	<u> </u>	· ` ·	, ,			ŕ		· ` ·		1 .	1	(0.4
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation m = 1, the				•				0.5]				
(24d)m= 0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			-		
(25)m= 0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(25
0 115541555	a and ba	at land							•				
3. Heat losse	_	·			NI at A a		11 -1	_	A 37.11		1 -1		A 37 I
ELEMENT	Gros area		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·l		AXk kJ/K
Windows					3.17	x1,	/[1/(1.4)+	0.04] =	4.2				(27
Walls Type1	36.3	3	12.68	3	23.62	<u>x</u>	0.18	=	4.25				(29
Walls Type2	24.	1	0		24.1	X	0.18	=	4.34			\neg	(29
Total area of e	elements	, m²			60.4								(31
* for windows and	d roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
** include the area				s and pan	titions								
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				25.4	(33
Heat capacity	Cm = S(Axk)						((28).	(30) + (32	?) + (32a).	(32e) =	0	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35
For design asses				construct	ion are not	known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
can be used inste	ad of a def	talied calci	uation.										
Thormal bridg	00 . 0 /1	v V) ool		icina An	nondiy k	,							(20
_	,	,	culated (• .	•	<						3.02	(36
if details of therma	al bridging	,	culated (• .	•	<		(33) +	· (36) =				
if details of therma Total fabric he	al bridging eat loss	are not kn	culated (own (36) =	= 0.05 x (3	•	<			· (36) =	25)m x (5)	3.02	
if details of therma Total fabric he Ventilation hea	al bridging eat loss at loss ca	are not kn	culated (own (36) =	= 0.05 x (3	1)		Aug	(38)m	= 0.33 × (2		1		
f details of therma Total fabric he Ventilation hea	al bridging eat loss at loss ca Feb	are not kn alculated Mar	culated (own (36) = I monthly Apr	- 0.05 x (3 / May	Jun	Jul	Aug 35.45	(38)m Sep	= 0.33 × (2	Nov	Dec		(37
Total fabric he Ventilation hea Jan (38)m= 37.44	eat loss cat loss cat loss cat sat loss cat sat sat sat sat sat sat sat sat sat s	alculated Mar 37.12	culated (own (36) =	= 0.05 x (3	1)		Aug 35.45	(38)m Sep 35.82	= 0.33 × (3 Oct 36.23	Nov 36.51	1		(37
Total fabric he Ventilation hea [38]m= 37.44 Heat transfer of	al bridging eat loss at loss ca Feb 37.28 coefficier	alculated Mar 37.12	culated (own (36) = I monthly Apr 36.37	- 0.05 x (3 / May 36.23	Jun 35.57	Jul 35.57	35.45	(38)m Sep 35.82	$= 0.33 \times (3)$ Oct 36.23 $= (37) + (3)$	Nov 36.51 38)m	Dec 36.81		(37
Total fabric he Ventilation hea (38)m= 37.44 Heat transfer (eat loss cat loss cat loss cat sat loss cat sat sat sat sat sat sat sat sat sat s	alculated Mar 37.12	culated (own (36) = I monthly Apr	- 0.05 x (3 / May	Jun	Jul		(38)m Sep 35.82 (39)m 64.24	0.33 × (2) Oct 36.23 = (37) + (3) 64.65	Nov 36.51 38)m 64.93	Dec 36.81	28.42	(37
if details of thermal Total fabric her Ventilation her Jan (38)m= 37.44 Heat transfer (39)m= 65.86	eat loss cat los cat loss cat loss cat loss cat	alculated Mar 37.12 nt, W/K	culated (100m (36) = 1 monthly Apr 36.37	- 0.05 x (3 / May 36.23	Jun 35.57	Jul 35.57	35.45	(38)m Sep 35.82 (39)m 64.24	Oct 36.23 = (37) + (36.465) Average =	Nov 36.51 38)m 64.93 Sum(39) ₁	Dec 36.81		(37
(38)m= 37.44 Heat transfer (eat loss cat los cat loss cat loss cat loss cat	alculated Mar 37.12 nt, W/K	culated (100m (36) = 1 monthly Apr 36.37	- 0.05 x (3 / May 36.23	Jun 35.57	Jul 35.57	35.45	(38)m Sep 35.82 (39)m 64.24	0.33 × (2) Oct 36.23 = (37) + (3) 64.65	Nov 36.51 38)m 64.93 Sum(39) ₁	Dec 36.81	28.42	(36)

Number of days in month (Table 1a)

Numbe	er or day	s in mor	ıın (Tab	ie ra)		T	,		,				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)
						•	•	•	•				1	
4 \\/\	tor boot	ing oner	av roqui	romont:								kWh/ye	oor:	
4. ۷۷	ilei ileai	ing ener	gy requi	rement.								KVVII/yt	sai.	
Assum	ed occu	pancy, I	N								2.	38		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
	A £ 13.9	-						(O.E. N.I.)	00				•	
								(25 x N)	+ 36 a water us	se target o		.79		(43)
		_	person per			-	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate						l .	Table 1c x		Т Зер	Oct	NOV	Dec		
								·	00.07	00.0	00.00	00.07	1	
(44)m=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87		7,,,,
Eneray (content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.i	m x nm x E	OTm / 3600) kWh/mor	Total = Su oth (see Ta			1089.44	(44)
													1	
(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42		7(45)
If instant	taneous w	ater heatii	na at point	of use (no	hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1428.42	(45)
			,	,		· ·		· ·	, , , I	10.15	10.04	04.54	1	(46)
(46)m= Water	22.21 storage	19.43	20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51		(46)
	•		includin	na anv so	olar or W	/WHRS	storage	within s	ame ves	ടല		150	I	(47)
_		, ,					_		AIIIC VCS	001		150		(47)
	•	_			-) litres in	, ,	ers) ente	or 'O' in (47)			
	storage		not wate	i (uno n	iciuues i	Hotalital	ieous cc	ווטט וטוווע	ers) erite	51 0 111 (47)			
	•		eclared l	oss facto	or is kno	wn (kWl	n/dav):				1	65		(48)
,			m Table			(<i>"</i> aay / :							(49)
•								(40) (40)	、			54		
• • • • • • • • • • • • • • • • • • • •			storage eclared o	-		or is not	known:	(48) x (49) =		0.	89		(50)
			factor fr									0		(51)
			ee secti		- (,							(0.7)
	e factor	_										0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54)
٠.	(50) or (•						, , , ,	·	-	89		(55)
	. , ,	, ,	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m=	27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66	Ī	(56)
` '									7)m = (56)				 iv H	(30)
ii cyiii ide	- Contains	dedicated	30181 310	rage, (37)	11 = (30)111	X [(30) — (· · · · · · · · · · · · · · · · · · ·	r (3	<i>r</i>	iii wiieie (1111) 13 110	пі Аррепа	I	
(57)m=	27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
Primar	y circuit	loss cal	culated t	for each	month (59)m =	(58) ÷ 36	65 × (41)	m				•	
(mod	dified by	factor fr	om Tab	le H5 if t	here is s	solar wa	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	ادم وورا	culated	for each	month /	(61)m –	(60) ÷ 30	65 × (41)m	•	•			•	
(61)m=	0	0	0	0	0	0 0	05 x (41	0	0	0	0	0		(61)
(01)111=		U	U	U		L <u> </u>	L	L			U	Ŭ		(01)

Scale 19-0.02 17-5.02 18-1.09 16-1.08 16-2.74 14-0.77 14-0.33 15-2.12 15-3.1 17-1.02 18-1.30 194-35 16-3.5	Total heat required for wa	ater he	ating ca	alculated	l fo	each month	(62)	m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
Company Comp	(62)m= 199.02 175.52 18	84.59	165.81	162.74	14	5.77 140.33	153	.52	153.1	171.92	181.36	194.35		(62)
Column	Solar DHW input calculated using	ng Appe	endix G or	Appendix	H (negative quantity	v) (ent	er '0'	if no solar	contribu	ition to wate	er heating)		
Output from water heater (64)m= 199.02 175.52 184.59 165.81 162.74 145.77 140.33 153.52 153.1 171.92 1813.6 194.35 Output from water heater (annual)	(add additional lines if FG	HRS a	and/or V	VWHRS	ар	plies, see Ap	pend	lix G	i)				_	
Geliman 199,02 175,52 184,59 165,81 162,74 145,77 140,33 153,52 153,1 171,92 181,36 194,35 2028,04 (4)	(63)m= 0 0	0	0	0		0 0	0		0	0	0	0		(63)
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	Output from water heater	,												
Heat gains from water betting, kWh/morth 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m 89.98 79.87 85.18 78.17 77.92 71.51 70.47 74.85 73.95 80.97 83.34 88.43 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating Secondary Seco	(64)m= 199.02 175.52 18	84.59	165.81	162.74	14	5.77 140.33	153	.52	153.1	171.92	181.36	194.35		
(65) (65)								Outp	ut from wa	iter heat	er (annual) ₁	12	2028.04	(64)
Include (67)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	Heat gains from water he	ating,	kWh/mo	onth 0.2	5 ′	[0.85 × (45)m	+ (6	1)m] + 0.8 x	[(46)m	ı + (57)m	+ (59)m	ı]	
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(65)m= 89.98 79.87 8	35.18	78.17	77.92	7	1.51 70.47	74.	85	73.95	80.97	83.34	88.43		(65)
Metabolic gains (Table 5), Watts	include (57)m in calcula	ation o	of (65)m	only if c	ylin	der is in the	dwell	ing o	or hot wa	ater is t	from com	munity h	neating	
Metabolic gains (Table 5), Watts	5. Internal gains (see Ta	able 5	and 5a):										
Second Company Compa			·											
Ge ma				May	Γ,	Jun Jul	A	ug	Sep	Oct	Nov	Dec]	
(67)m=		19.13			_			-		119.13	119.13	119.13		(66)
(67)m=	Lighting gains (calculated	in Apr	pendix l	L. eguat	ion	L9 or L9a). a	lso s	ee T	able 5		ļ	<u> </u>	ı	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 210.88 213.07 207.55 195.81 180.99 167.07 157.76 155.57 161.09 172.83 187.65 201.57 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.91					_			_		16.8	19.61	20.91	1	(67)
(68)		ated in	Append	lix I ea	uati	on I 13 or I 1:	3a) :	also		ole 5	Į	l	ı	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.91	· · · · · · · · · · · · · · · · · · ·				_		<u> </u>				187.65	201.57	1	(68)
(69)m=													l	` ,
Pumps and fans gains (Table 5a) (70)m= 3		 			_	 			Т		34 91	34 91	1	(69)
Color Colo	` '			01.01		1.01	0 1	<u> </u>	0 1.01	0 1.0 1	001	0 1.01	l	()
Losses e.g. evaporation (negative values) (Table 5) (71)m=	·			3	Г	3 3	3		3	3	3	3	1	(70)
(71)m= -95.3 <td></td> <td></td> <td></td> <td></td> <td><u> </u></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>l</td> <td>(10)</td>					<u> </u>								l	(10)
Water heating gains (Table 5) (72)m= 120.95		` 		<u> </u>	_	 	05	2	05.2	05.2	05.2	05.2	1	(71)
Total internal gains =			-95.5	-90.3		95.5	-90	1.3	-90.5	-90.5	-95.5	-90.5	J	(7-1)
Total internal gains =			100.57	404.70		0.00	400	<u> </u>	100 7 1	400.00	145 75		1	(70)
(73)m= 413.9 411.72 398.48 377.25 355.78 335.14 321.8 327.78 338.76 360.2 384.75 403.08 (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 m² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.54 x 3.17 x 11.28 x 0.63 x 0.7 = 30.66 (75) Northeast 0.9x 0.54 x 3.17 x 22.97 x 0.63 x 0.7 = 62.42 (75) Northeast 0.9x 0.54 x 3.17 x 41.38 x 0.63 x 0.7 = 112.45 (75) Northeast 0.9x 0.54 x 3.17 x 41.38 x 0.63 x 0.7 = 112.45 (75) Northeast 0.9x 0.54 x 3.17 x 67.96 x 0.63 x 0.7 = 184.68 (75) Northeast 0.9x 0.54 x 3.17 x 91.35 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75)		14.49	108.57	104.73	9							<u> </u>	J	(12)
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 6a Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.54		T					<u> </u>		` 		<u>, , , , , , , , , , , , , , , , , , , </u>		1	(70)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d m^2 Flux g_{-} FF Gains Table 6c (W) Northeast $0.9x$ 0.54 \times 3.17 \times 11.28 \times 0.63 \times 0.7 $=$ 30.66 (75) Northeast $0.9x$ 0.54 \times 3.17 \times 22.97 \times 0.63 \times 0.7 $=$ 62.42 (75) Northeast $0.9x$ 0.54 \times 3.17 \times 41.38 \times 0.63 \times 0.7 $=$ 112.45 (75) Northeast $0.9x$ 0.54 \times 0.55 \times 0.65	` '	98.48	377.25	355.78	33	5.14 321.8	327	.78	338.76	360.2	384.75	403.08		(73)
Orientation: Access Factor Table 6d Area m² Flux Table 6a g_ Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.54 x 3.17 x 11.28 x 0.63 x 0.7 = 30.66 (75) Northeast 0.9x 0.54 x 3.17 x 22.97 x 0.63 x 0.7 = 62.42 (75) Northeast 0.9x 0.54 x 3.17 x 41.38 x 0.63 x 0.7 = 112.45 (75) Northeast 0.9x 0.54 x 3.17 x 67.96 x 0.63 x 0.7 = 184.68 (75) Northeast 0.9x 0.54 x 3.17 x 91.35 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 264.66 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 244.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 244.66 (75)		na color	flux from	Toblo 60	and	aggregated agus	tiona	to oo	overt to the	o opplied	blo orientat	ion		
Table 6d m² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.54 x 3.17 x 11.28 x 0.63 x 0.7 = 30.66 (75) Northeast 0.9x 0.54 x 3.17 x 22.97 x 0.63 x 0.7 = 62.42 (75) Northeast 0.9x 0.54 x 3.17 x 41.38 x 0.63 x 0.7 = 112.45 (75) Northeast 0.9x 0.54 x 3.17 x 67.96 x 0.63 x 0.7 = 184.68 (75) Northeast 0.9x 0.54 x 3.17 x 91.35 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75) Northeast 0.9x 0.54 x 3.17 x 97.38 x 0.63 x 0.7 = 248.25 (75)	•	•			anu	•	110115	io coi		е аррііса		IOH.	Cains	
Northeast 0.9x		loi						Ta		٦				
Northeast 0.9x	Northeast _{0.9x} 0.54	X	3.1	7	x	11.28	x		0.63	x	0.7	=	30.66	(75)
Northeast 0.9x	Northeast 0.9x 0.54	x	3.1	7	x	22.97	х		0.63	×	0.7		62.42	(75)
Northeast 0.9x	Northeast _{0.9x} 0.54	= x	3.1	7	x [41.38	x		0.63	x	0.7		112.45	(75)
Northeast 0.9x	Northeast _{0.9x} 0.54	= x	3.1	7	x [67.96	x		0.63		0.7	=	184.68	1 (75)
Northeast 0.9x	Northeast _{0.9x} 0.54	= x	3.1	7	x [91.35	x		0.63		0.7	=	248.25	1 (75)
Northeast 0.9x 0.54 x 3.17 x 91.1 x 0.63 x 0.7 = 247.58 (75)	Nanthana	= x			x		x			i x i		-		1 (75)
Northwest Control Cont	Northeast 0.9x 0.54	= x			x [91.1	x		0.63	- x	0.7	-		╡
	Northeast _{0.9x} 0.54	-			x [72.63	x		0.63	= x	0.7	=	197.37	1 (75)

Northeas	st _{0.9x}	0.54	x	3.1	7	x	5	0.42	x		0.63	х	0.7	=	137.03	(75)
Northeas	st _{0.9x}	0.54	x	3.1	7	x	2	8.07	x		0.63	_ x _	0.7		76.28	(75)
Northeas	st _{0.9x}	0.54	x	3.1	7	X		14.2	x		0.63	= x =	0.7	=	38.58	(75)
Northeas	st _{0.9x}	0.54	x	3.1	7	X	,	9.21	x		0.63	= x =	0.7	=	25.04	(75)
	_								•							_
Solar ga	ains in	watts, ca	alculated	for eacl	h month				(83)m	า = Sเ	um(74)m .	(82)m				
(83)m=	30.66	62.42	112.45	184.68	248.25		64.66	247.58	197	.37	137.03	76.28	38.58	25.04		(83)
Total ga	ains – ii	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts						!	ı	
(84)m=	444.57	474.14	510.93	561.93	604.02	5	599.8	569.38	525	.16	475.79	436.48	423.33	428.12		(84)
7. Mea	an inter	nal temp	erature	(heating	season)										
			eating p				area i	from Tab	ole 9.	. Th	1 (°C)				21	(85)
•		Ū	ains for I			·			J.O 0	,	. ()				21	(0.07
Г	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.96	0.86	-	0.66	0.49	0.5	Ť	0.83	0.98	1	1		(86)
` ' L			ļļ			_		<u> </u>		!		0.00	<u> </u>	<u> </u>		(00)
Г			ature in l			_							1	1	Ī	(07)
(87)m=	20.14	20.24	20.42	20.68	20.9		20.98	21	2	1	20.94	20.68	20.37	20.13		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	elling/	from Ta	ble 9	9, Tł	n2 (°C)			_	-	
(88)m=	20.2	20.2	20.2	20.21	20.21	2	20.22	20.22	20.	22	20.21	20.21	20.21	20.2		(88)
Utilisat	tion fac	tor for g	ains for r	est of d	welling,	h2	,m (se	e Table	9a)							
(89)m=	1	1	0.99	0.95	0.82		0.59	0.41	0.4	16	0.77	0.97	0.99	1		(89)
Meani	interna	l temper	ature in t	the rest	of dwalli	ina	T2 (f	ollow etc	nc 3	to 7	7 in Tahl	0.00			l	
(90)m=	19.04	19.18	19.45	19.83	20.11	Ť	20.21	20.22	20.		20.16	19.83	19.38	19.02		(90)
(00)=	10.01	10.10	10.10	10.00	20.11								g area ÷ (4		0.57	(91)
													3 (,	0.57	(0.)
г			ature (fo			$\overline{}$	<u> </u>	i	<u> </u>						Ī	(00)
(92)m=	19.67	19.78	20	20.32	20.56	_	20.65	20.66	20.	•	20.61	20.31	19.95	19.65		(92)
· · · · r			he mean		· ·	т —		1	1			•		T	1	(00)
(93)m=	19.67	19.78	20	20.32	20.56	<u> </u>	20.65	20.66	20.	66	20.61	20.31	19.95	19.65		(93)
			uirement					44 . (T - 1. 1	L - OL	11 -	(T ' /'	70)	.1	la (a	
			ernal ter or gains u	•		nec	at ste	ер 11 от	rabi	ie 90	o, so tha	t 11,m=(76)m an	a re-caic	culate	
Г	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
L Utilisat			ains, hm				-			<u>~9 </u>	Cop					
(94)m=	1	0.99	0.99	0.95	0.84		0.63	0.46	0.5	51	0.8	0.97	0.99	1		(94)
Useful	gains,	hmGm ,	W = (94	I)m x (84	4)m				<u>!</u>	!				<u>!</u>	l	
г	443.21	471.67	504.28	535.43	508.25	3	78.92	259.11	270	.36	382.62	422.79	420.63	427.08		(95)
Month	ly avera	age exte	rnal tem	perature	from T	abl	e 8		<u>. </u>				ı			
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	e for mea	an intern	al tempe	erature,	Lm	າ , W =	=[(39)m :	x [(9:	3)m-	– (96)m]			1	
(97)m=	1012.52	977.87	885.06	739.65	572.61	3	87.22	259.98	272	2.2	418.01	627.98	834.24	1008.09		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x [[(97)	m – (95)m] x (4	1)m		l	
(98)m=	423.56	340.17	283.29	147.04	47.88		0	0	0	Í	0	152.66	297.79	432.27		
_						•		•	•	Total	per year	(kWh/year) = Sum(9	8) _{15,912} =	2124.67	(98)
Space	heatin	a reauire	ement in	kWh/m²	?/vear										27.96	(99)
22400		J . 394111			. , ວັດເ											

9a. Energy requiremer	nts – Indivi	ridual h	eating sv	/stems i	ncluding	micro-C	CHP)					
Space heating:					<u> </u>		,					_
Fraction of space hea				mentary	-						0	(201)
Fraction of space hea		-	` '			(202) = 1 -					1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$											1	(204)
Efficiency of main spa	ace heatin	ng syste	em 1								93.5	(206)
Efficiency of seconda	ry/suppler	mentar	y heating	g system	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating require	' ' - '		i				0	450.00	007.70	400.07	1	
423.56 340.17		147.04	47.88	0	0	0	0	152.66	297.79	432.27		
(211) m = { (98) m x (20)	· · ·			0		_	0	162.07	240.5	462.22	1	(211)
453.01 363.82	302.99	157.26	51.21	0	0	0 Tota	0 I (kWh/yea	163.27	318.5	462.32	2272.27	(211)
Space booting fuel (s	ooondoru)	\	month			rota	i (kwii) you	ar) =00m(2	- ' '/15,1012		2272.37	(211)
Space heating fuel (s = {[(98)m x (201)] } x 1	• ,	•	monun									
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		
						Tota	l (kWh/yea	ar) =Sum(2	215),,,,5,10,12	=	0	(215)
Water heating												_
Output from water hea											1	
199.02 175.52		165.81	162.74	145.77	140.33	153.52	153.1	171.92	181.36	194.35	70.0	7(246)
Efficiency of water hear 217)m= 86.78 86.55	85.95	84.5	82	79.8	79.8	79.8	79.8	84.5	86.13	86.89	79.8	(216)
Fuel for water heating,			02	79.0	79.0	79.0	79.0	04.0	00.13	00.09		(211)
(219)m = (64) m x 100											<u>.</u>	
(219)m= 229.34 202.8	214.75	196.24	198.45	182.67	175.86	192.38	191.86	203.46	210.57	223.68		_
						Tota	I = Sum(2				2422.05	(219)
Annual totals Space heating fuel use	ad main s	wstem	1					k\	Wh/year	•	kWh/yea 2272.37	<u>r</u>
		system	•									╡
Nater heating fuel use											2422.05	
Electricity for pumps, f	ans and e	electric l	keep-ho	t							_	
central heating pump	:									30		(2300
boiler with a fan-assis	sted flue									45		(230
Total electricity for the	above, kV	Nh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											359.22	(232)
12a. CO2 emissions	– Individua	al heati	na svste	ms inclu	ıdina mi	cro-CHP)					
			g cycle									
					ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main s	system 1)			(21	I) x			0.2	16	=	490.83	(261)
Space heating (second	dary)			(21	5) x			0.5	19	=	0	(263)
Water heating				(219	9) x			0.2	16	=	523.16	
Space and water heati	ina					+ (263) + (264) =	<u> </u>	-		1014	(265)
opaco and water neat	9			(, (/	(/ - (,				1014	(203)

TER =

(273)

16.31

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 *Printed on 24 November 2020 at 17:43:09*

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 102.3m²

Site Reference: Tottenham Mews Plot Reference: 2_04 - 3B5P

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 14.56 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.98 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 39.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.1 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.20 (max. 0.30)0.20 (max. 0.70)

Floor (no floor)

Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs **OK**

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.61	
Maximum	1.5	ОК
MVHR efficiency:	79%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	6.58m²	
Windows facing: South West	2.1m²	
Windows facing: North East	3.17m ²	
Windows facing: South West	6.58m²	
Ventilation rate:	6.00	
Blinds/curtains:	Dark-coloured curtain or roller	· blind
	Closed 100% of daylight hour	S
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from boilers - mains gas		

Assessor Name: Vitaliy Troyan Stroma Number: STRO018096 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.12 Property Address: 2_04 - 3B5P
Property Address: 2 04 - 3B5P
Address:
1. Overall dwelling dimensions:
Area(m²) Av. Height(m) Volume(m³)
Ground floor 102.3 (1a) x 2.65 (2a) = 271.1 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 102.3 (4)
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 271.1$ (5)
2. Ventilation rate:
main secondary other total m³ per hour heating heating
Number of chimneys $0 + 0 + 0 = 0 \times 40 = 0$ (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$ (6b)
Number of intermittent fans $0 \times 10 = 0 $ (7a)
Number of passive vents $0 x 10 = 0 (7b)$
Number of flueless gas fires $0 x 40 = 0 (7c)$
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)
Additional infiltration $[(9)-1]\times 0.1 = 0 $ (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)
If no draught lobby, enter 0.05, else enter 0
Percentage of windows and doors draught stripped 0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)
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 4 (19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.7$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.1$ (21)
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
(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	speed) =	(21a) x	(22a)m					
0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12]	
Calculate effect		-	rate for t	he appli	cable ca	se							(23a
If exhaust air he			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	wise (23b) = (23a)			0.5	(23a)
If balanced with									, (200)			0.5 67.15	(230
a) If balance		•	•	J		`		'	2h\m + (23h) 🗴 [1 – (23c)		(230
(24a)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29]	(24a
b) If balance	d mecha	anical ve	ntilation	without	heat rec	coverv (N	ı ЛV) (24b)m = (22	2b)m + (1 23b)	<u> </u>	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b
c) If whole h					•				5 × (23b))	!	1	
(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	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29		(25)
3. Heat losse	s and he	eat loss r	paramet	er.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	λΧk
	area	(m²)	m		A ,r		W/m2		(W/	K)	kJ/m²-		J/K
Windows Type	: 1				6.58	x1,	/[1/(1.1)+	0.04] =	6.93				(27)
Windows Type	2				1.05	x1,	/[1/(1.1)+	0.04] =	1.11				(27)
Windows Type	: 3				3.17	x1,	/[1/(1.1)+	0.04] =	3.34				(27)
Windows Type	4				3.29	x1,	/[1/(1.1)+	0.04] =	3.47				(27)
Walls Type1	58.8	8	18.4	3	40.37	y X	0.2	= [8.07				(29)
Walls Type2	20.	1	0		20.1	Х	0.19	= [3.72				(29)
Total area of e	lements	, m²			78.9								(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	h 3.2	
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				31.21	(33)
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	•	•		,					tive Value			100	(35)
For design assess can be used instead				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
Thermal bridge				usina An	pendix k	<						11.84	(36)
if details of therma	,	,			•							11.01	(33)
Total fabric he	at loss							(33) +	(36) =			43.05	(37)
Ventilation hea	t loss ca	alculated	monthl	/				(38)m	= 0.33 × ((25)m x (5))	-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 26.67	26.44	26.2	25.03	24.79	23.62	23.62	23.38	24.09	24.79	25.26	25.73]	(38)
Heat transfer o	oefficier	nt, W/K						(39)m	= (37) + (38)m		_	
(39)m= 69.72	69.49	69.25	68.08	67.84	66.67	66.67	66.43	67.14	67.84	68.31	68.78		
									Average =	Sum(39) ₁	12 /12=	68.02	(39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.68	0.68	0.68	0.67	0.66	0.65	0.65	0.65	0.66	0.66	0.67	0.67		
				!		!			Average =	Sum(40) ₁	12 /12=	0.66	(40)
Number of day	<u> </u>			·	i .				<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 requi	rement:								kWh/ye	ar:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		76		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed i			se target c		.75		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 109.72	105.73	101.74	97.75	93.76	89.77	89.77	93.76	97.75	101.74	105.73	109.72		
										m(44) ₁₁₂ =	L	1196.95	(44)
Energy content of	f hot water	used - cal	culated me	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= 162.71	142.31	146.85	128.03	122.85	106.01	98.23	112.72	114.07	132.93	145.11	157.58		_
If instantaneous v	vator hoati	na at noint	of use (no	n hot water	r storage)	antar () in	hoves (16		Total = Su	m(45) ₁₁₂ =	= [1569.39	(45)
			,				· · ·	, , , I	1004	04.77	00.04		(46)
(46)m= 24.41 Water storage	21.35 loss:	22.03	19.2	18.43	15.9	14.73	16.91	17.11	19.94	21.77	23.64		(46)
Storage volum) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If community h	neating a	and no ta	nk 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				!	(1.) (1.)	- /-1 \					1		(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					24		(48)
Temperature f							(40) (40)				.6		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1.	34		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor			Ol-								0		(52)
Temperature f											0		(53)
Energy lost from Enter (50) or		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Water storage	` , ` `	,	or each	month			((56)m - ((55) × (41)	m	1.	34		(55)
					40.00		. , ,	·		1,000	14.00		(FC)
(56)m= 41.66 If cylinder contain	37.63	41.66	40.32	41.66 m = (56)m	40.32 × [(50) = (41.66	41.66	40.32 7)m = (56)	41.66	40.32 H11) is fro	41.66	v H	(56)
												A 1 1	(57)
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	,	•									0		(58)
Primary circuit				,	•		, ,		r thorns -	otot)			
(modified by	21.01				ı —			-	1	'	22.26		(59)
(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		(38)

Combi loss calcula	ed for eac	h month	(61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(61)
Total heat required	L for water h	neating c	alculated	l for eac	h month	(62)r	<u>—</u> m =	0.85 x (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 227.64 200		190.86	187.77	168.84	163.16	177.	_	176.9	197.86	207.94	222.5]	(62)
Solar DHW input calcula	ted using Ap	pendix G o	r Appendix	H (negati	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	J	
(add additional line	if FGHRS	and/or \	NWHRS	applies	, see Ap	pend	lix G	3)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water I	eater	•			•		•		•	•	•	•	
(64)m= 227.64 200	95 211.78	190.86	187.77	168.84	163.16	177.	.65	176.9	197.86	207.94	222.5]	
	•	•			•		Outp	ut from wa	ater heate	er (annual)	112	2333.85	(64)
Heat gains from wa	ter heating	ı, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	i] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 106.04 94.2	3 100.77	92.83	92.79	85.51	84.6	89.4	42	88.19	96.14	98.51	104.34]	(65)
include (57)m in	alculation	of (65)m	only if c	ylinder i	s in the	dwelli	ing (or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see Table	5 and 5a):										
Metabolic gains (Ta	ble 5), Wa	tts											
Jan Fe		Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 137.99 137.	99 137.99	137.99	137.99	137.99	137.99	137.	.99	137.99	137.99	137.99	137.99		(66)
Lighting gains (calc	ulated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5			-	-	
(67)m= 24.01 21.3	2 17.34	13.13	9.81	8.28	8.95	11.6	64	15.62	19.83	23.14	24.67]	(67)
Appliances gains (d	alculated i	n Appen	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ble 5		•	•	
(68)m= 259.99 262	69 255.89	241.42	223.15	205.98	194.51	191.	.81	198.61	213.08	231.35	248.52]	(68)
Cooking gains (calc	ulated in A	Appendix	L, equat	ion L15	or L15a), also	o se	e Table	5	•	•	•	
(69)m= 36.8 36.	36.8	36.8	36.8	36.8	36.8	36.	8	36.8	36.8	36.8	36.8]	(69)
Pumps and fans ga	ins (Table	5a)			•							•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evapor	ation (nega	ative valu	es) (Tab	le 5)	-				=		-	-	
(71)m= -110.39 -110	39 -110.39	-110.39	-110.39	-110.39	-110.39	-110	.39	-110.39	-110.39	-110.39	-110.39]	(71)
Water heating gain	(Table 5)		-		-				-	-	-	-	
(72)m= 142.53 140.	23 135.44	128.94	124.71	118.77	113.71	120.	.19	122.49	129.22	136.83	140.24]	(72)
Total internal gain	s =			(66)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m		
(73)m= 490.93 488.	64 473.07	447.88	422.07	397.43	381.57	388.	.03	401.11	426.53	455.72	477.83		(73)
6. Solar gains:													
Solar gains are calcula	•	ar flux from	Table 6a		•	tions t	to co	nvert to th	e applica		tion.		
Orientation: Acces		Area m²		Flu	ıx ble 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
						, ,	1		_ '				1
	.54	6.	58	X	11.28	X		0.44	_ ×	0.8	=	12.7	(75)
Nieutheest	.54			Χ	11.28	X		0.44	_ ×	8.0	=	6.12	(75)
N	.54			-	22.97	X		0.44	x	0.8	=	25.85	(75)
	.54	3.	17	-	22.97	X		0.44	×	8.0	=	12.45	(75)
Northeast _{0.9x}	.54	6.5	58	X 2	41.38	X		0.44	X	0.8	=	46.58	(75)

Northwest		7		1		1		ı		1		–
Northeast _{0.9x}	0.54	X	3.17	X	41.38	X	0.44	X	0.8	=	22.44	(75)
Northeast _{0.9x}	0.54	X	6.58	X	67.96	X	0.44	X	0.8	=	76.49	(75)
Northeast _{0.9x}	0.54	X	3.17	X	67.96	X	0.44	X	0.8	=	36.85	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.35	X	0.44	X	0.8	=	102.82	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.35	X	0.44	X	0.8	=	49.54	(75)
Northeast _{0.9x}	0.54	X	6.58	X	97.38	X	0.44	X	0.8	=	109.62	(75)
Northeast _{0.9x}	0.54	X	3.17	X	97.38	X	0.44	X	0.8	=	52.81	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.1	X	0.44	X	0.8	=	102.55	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.1	X	0.44	X	0.8	=	49.4	(75)
Northeast 0.9x	0.54	X	6.58	X	72.63	X	0.44	x	0.8	=	81.75	(75)
Northeast _{0.9x}	0.54	X	3.17	X	72.63	X	0.44	X	0.8	=	39.39	(75)
Northeast _{0.9x}	0.54	X	6.58	X	50.42	X	0.44	X	0.8	=	56.76	(75)
Northeast _{0.9x}	0.54	X	3.17	x	50.42	x	0.44	x	0.8	=	27.34	(75)
Northeast _{0.9x}	0.54	X	6.58	X	28.07	x	0.44	x	0.8	=	31.59	(75)
Northeast _{0.9x}	0.54	X	3.17	x	28.07	x	0.44	x	0.8	=	15.22	(75)
Northeast _{0.9x}	0.54	X	6.58	x	14.2	х	0.44	x	0.8	=	15.98	(75)
Northeast _{0.9x}	0.54	X	3.17	x	14.2	x	0.44	x	0.8	=	7.7	(75)
Northeast _{0.9x}	0.54	X	6.58	x	9.21	x	0.44	x	0.8	=	10.37	(75)
Northeast _{0.9x}	0.54	x	3.17	x	9.21	x	0.44	x	0.8	=	5	(75)
Southwest _{0.9x}	0.54	x	1.05	x	36.79		0.44	x	0.8	=	13.22	(79)
Southwest _{0.9x}	0.54	X	3.29	x	36.79		0.44	x	0.8	=	41.42	(79)
Southwest _{0.9x}	0.54	X	1.05	x	62.67]	0.44	x	0.8	=	22.52	(79)
Southwest _{0.9x}	0.54	x	3.29	x	62.67]	0.44	x	0.8	=	70.55	(79)
Southwest _{0.9x}	0.54	X	1.05	x	85.75		0.44	x	0.8	=	30.81	(79)
Southwest _{0.9x}	0.54	x	3.29	x	85.75		0.44	x	0.8	=	96.53	(79)
Southwest _{0.9x}	0.54	x	1.05	x	106.25		0.44	x	0.8	=	38.17	(79)
Southwest _{0.9x}	0.54	X	3.29	x	106.25		0.44	x	0.8] =	119.6	(79)
Southwest _{0.9x}	0.54	x	1.05	x	119.01]	0.44	x	0.8	=	42.75	(79)
Southwest _{0.9x}	0.54	x	3.29	x	119.01	Ī	0.44	x	0.8] =	133.96	(79)
Southwest _{0.9x}	0.54	X	1.05	x	118.15	ĺ	0.44	x	0.8] =	42.45	(79)
Southwest _{0.9x}	0.54	x	3.29	x	118.15]	0.44	x	0.8] =	133	(79)
Southwest _{0.9x}	0.54	x	1.05	x	113.91	ĺ	0.44	x	0.8	=	40.92	(79)
Southwest _{0.9x}	0.54	x	3.29	x	113.91	ĺ	0.44	x	0.8	=	128.22	(79)
Southwest _{0.9x}	0.54	x	1.05	x	104.39	ĺ	0.44	х	0.8	j =	37.5	(79)
Southwest _{0.9x}	0.54	x	3.29	x	104.39	ĺ	0.44	x	0.8	j =	117.51	(79)
Southwest _{0.9x}	0.54	×	1.05	x	92.85	i	0.44	x	0.8	j =	33.36	(79)
Southwest _{0.9x}	0.54	×	3.29	x	92.85	j	0.44	x	0.8	j =	104.52	(79)
Southwest _{0.9x}	0.54	×	1.05	×	69.27	i	0.44	x	0.8	i =	24.88	(79)
Southwest _{0.9x}	0.54	X	3.29	X	69.27	ĺ	0.44	x	0.8	=	77.97	(79)
Southwest _{0.9x}	0.54	X	1.05	X	44.07	j	0.44	x	0.8	=	15.83	(79)
Southwest _{0.9x}	0.54	X	3.29	X	44.07	ĺ	0.44	x	0.8	=	49.61	(79)
<u> </u>		_		1		1		l				

Southwesto.9x
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 73.45
(83)m=
(83)m=
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m=
(84)m= 564.38 620.01 669.42 719 751.15 735.3 702.66 664.18 623.09 576.2 544.84 539.95 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)
(89)m= 0.96 0.94 0.9 0.82 0.69 0.5 0.35 0.39 0.62 0.84 0.94 0.96 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)
(90)m= 18.59 18.86 19.28 19.79 20.15 20.33 20.37 20.37 20.27 19.83 19.15 18.55 (90)
$fLA = Living area \div (4) = 0.47 $ (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$
(92)m= 19.12 19.35 19.7 20.14 20.46 20.63 20.66 20.66 20.56 20.18 19.6 19.09 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate
(93)m= 19.12 19.35 19.7 20.14 20.46 20.63 20.66 20.66 20.56 20.18 19.6 19.09 (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= 0.95 0.93 0.89 0.81 0.69 0.52 0.38 0.42 0.63 0.84 0.92 0.96 (94)
Useful gains, hmGm , W = (94)m x (84)m
(95)m= 535.68 576.16 596.93 585.95 518.63 382.85 266.66 276.88 393.95 481.69 503.8 515.7 (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= 1033.3 1003.97 914.44 765.51 594.32 401.73 270.98 283.06 434.03 649.66 853.56 1023.87 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(98)m= 370.23 287.48 236.23 129.28 56.31 0 0 0 124.97 251.82 378.08
Total per year $(kWh/year) = Sum(98)_{15,912} = 1834.42$ (98)
$\frac{1004.42}{1004.42} = \frac{1004.42}{1004.42}$
Space heating requirement in kWh/m²/year 17.93 (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 includes boilers, heat pumps, geothermal and waste heat from power stations.		our other heat sources; t		-
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 comm	, , ,		1	(305)
Distribution loss factor (Table 12c) for community heating syste	em		1.05	(306)
Space heating Annual space heating requirement			kWh/year 1834.42]
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1926.14	(307a)
Efficiency of secondary/supplementary heating system in % (from	om Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary sys	tem (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2333.85	_ ¬
If DHW from community scheme:			2333.85	J
Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2450.54	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	43.77	(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	n outside		252.19	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	₹
—			U	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	252.19	(330g) (331)
Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L)	=(330a) + (330b	b) + (330g) =		╣
•	=(330a) + (330b	p) + (330g) =	252.19	(331)
Energy for lighting (calculated in Appendix L)	=(330a) + (330b Energy kWh/year	Emission factor	252.19 423.94	(331)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	252.19 423.94 Emissions kg CO2/year	(331)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	Energy kWh/year	Emission factor kg CO2/kWh	252.19 423.94 Emissions kg CO2/year	(331)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	Energy kWh/year	Emission factor kg CO2/kWh	252.19 423.94 Emissions kg CO2/year	(331) (332) (367a)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using CO2 associated with heat source 1 [(307b)-	Energy kWh/year ag two fuels repeat (363) to +(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	252.19 423.94 Emissions kg CO2/year 89.5 1056.27 22.71	(331) (332) (367a) (367)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme 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	Energy kWh/year ag 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 =	252.19 423.94 Emissions kg CO2/year 89.5 1056.27 22.71 1078.98	(331) (332) (367a) (367) (372)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme 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 ag 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 =	252.19 423.94 Emissions kg CO2/year 89.5 1056.27 22.71 1078.98 0	(331) (332) (367a) (367) (372) (373)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme 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 CO2 associated with space heating (secondary)	Energy kWh/year ag 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 =	252.19 423.94 Emissions kg CO2/year 89.5 1056.27 22.71 1078.98	(331) (332) (367a) (367) (372) (373) (374)
Energy for lighting (calculated in Appendix L) 12b. CO2 Emissions – Community heating scheme 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 CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantant	Energy kWh/year ag two fuels repeat (363) to +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	252.19 423.94 Emissions kg CO2/year 89.5 1056.27 22.71 1078.98 0 1078.98	(331) (332) (332) (367a) (367) (372) (373) (374) (375)

CO2 associated with electricity for light	(332))) x	0.52	=	220.03	(379)	
Total CO2, kg/year	sum of (376)(382) =				1429.89	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.98	(384)
El rating (section 14)					86.99	(385)

			User D	otoile:						
	\". F = T		USELL					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 201	12		Strom: Softwa					018096 on: 1.0.5.12	
Software Name.	Stroma i SAI 20		operty .	Address				VCISIO	71. 1.0.5.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	1(0-)	Volume(m ³	<u>-</u>
	\				(1a) x	2	.65	(2a) =	271.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n))1	02.3	(4)					_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	271.1	(5)
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır
N. selven of all leaves a	heating	neating	· —		, –			40		_
Number of chimneys	0 +	0]	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] + L	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	4	X '	10 =	40	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	Sa)+(6b)+(7a	a)+(7b)+(7c) =	Г	40		÷ (5) =	0.15	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.15	(0)
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
deducting areas of openi		sponding to	ırıe great	er wan 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, en	ter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	, ,	_			0	(15)
Infiltration rate		_		(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,	· ·		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil Air permeability value applie						is haina u	sad		0.4	(18)
Number of sides sheltere		s been done	or a deg	gree air per	теаышу	is being u	seu		4	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.28	(21)
Infiltration rate modified f	or monthly wind speed	d						!		
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (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]	
						<u> </u>	Ц	L	J	

0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33		
alculate effe		-	rate for t	he appli	cable ca	se						<u>-</u>	
If mechanical If exhaust air h			andiv N. (2	2h) _ (22c	a) × Emy (c	auation (N	JEN otho	avica (22h) - (222)			0	(2
If balanced with) = (25a)			0	(2
		•	-	_					2h\ //	00h) [/	1 (00 a)	0	(2
a) If balance	o mech	o o	0	o with ries	0		1K) (248	0	0	23D) x [0) - 100]]	(2
b) If balance			-									_	(-
4b)m= 0	o mecn	o 0	0	without 0	0	overy (N	0	0	0	23D) 0	0	7	(2
c) If whole h							<u> </u>		Ů			_	(-
if (22b)n				•	•				5 x (23b)			
4c)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	n from I	oft	Į		<u>!</u>	_	
if (22b)n				•	•				0.5]			_	
4d)m= 0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(
. Heat losse	s and he	eat loss r	naramete	ōt.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-valu	e	ΑΧk
	area	(m^2)	m		A ,r		W/m2		(W/I	<)	kJ/m²•		kJ/K
indows Type	: 1				6.58	x1,	/[1/(1.4)+	0.04] =	8.72				(
indows Type	2				1.05	x1,	/[1/(1.4)+	0.04] =	1.39				(
indows Type	3				3.17	x1,	/[1/(1.4)+	0.04] =	4.2				(:
indows Type	4				3.29	x1,	/[1/(1.4)+	0.04] =	4.36				(
alls Type1	58.	8	18.43	3	40.37	, x	0.18	□ = Ī	7.27	<u> </u>			(:
alls Type2	20.	1	0		20.1	x	0.18	<u> </u>	3.62	=		7 F	
otal area of e					78.9								(
or windows and	roof wind	ows, use e	ffective wi	ndow U-va		 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapi	h 3.2	`
include the area	as on both	sides of in	ternal wal	ls and par	titions								
bric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				35.32	(
eat capacity	Cm = S	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(
r design assess n be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
nermal bridge				ısina Ar	pendix l	<						3.95	(
letails of therma	•	,			-	•						3.93	(
tal fabric he			,	,	,			(33) +	(36) =			39.26	(
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]	
	50.14	49.93	48.92	48.73	47.86	47.86	47.69	48.19	48.73	49.11	49.51]	(
3)m= 50.36					-		_				_	_	
3)m= 50.36 eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.88	0.87	0.87	0.86	0.86	0.85	0.85	0.85	0.85	0.86	0.86	0.87		
Number of de	vo in mo	nth /Tabl	0.10)					,	Average =	Sum(40) ₁ .	12 /12=	0.86	(40)
Number of day Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		<u> </u>								<u> </u>			
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		76		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.75		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				<u></u>				Сор		1			
(44)m= 109.72	105.73	101.74	97.75	93.76	89.77	89.77	93.76	97.75	101.74	105.73	109.72		
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	1196.95	(44)
(45)m= 162.71	142.31	146.85	128.03	122.85	106.01	98.23	112.72	114.07	132.93	145.11	157.58		
		<u> </u>						-	L Total = Su	M(45) ₁₁₂ =	=	1569.39	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)					
(46)m= 24.41	21.35	22.03	19.2	18.43	15.9	14.73	16.91	17.11	19.94	21.77	23.64		(46)
Water storage Storage volum) includin	a anv so	olar or W	/WHRS	storane	within sa	ame ves	امء		150		(47)
If community h	` '		•			•		ATTIC VOO.	001		130		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	65		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	89		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			<u> </u>	,	.,,					<u> </u>		(0.)
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (5	55)								0.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	, ,		r thoras -	otot)			
(modified by					ı —	ı —			ı —	<u> </u>	22.22		(59)
(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		(38)

0 111		,		(0.4)	(00)	05 (44)							
Combi loss cald	oulated	for each	month ($\frac{(61)m}{0}$	(60) ÷ 3	$\frac{65 \times (41)}{0}$		Ι ο	T 0	0	Ι ,	1	(61)
` '				<u> </u>			(00)	0 05	<u> </u>		(57)	(50) (64)	(01)
Total heat requi	188.31	197.78	177.31	173.77	155.29	n month 149.16	(6∠)m 163.65		(45)m + 183.86	(46)m + 194.39	(57)m + 208.5	(59)m + (61)m]	(62)
Solar DHW input ca				<u> </u>			l					l	(02)
(add additional									ir contribut	ion to wate	er nealing)		
(63)m= 0	0	0	0	0	0	0	0	To	0	0	0]	(63)
Output from wa	ter hea	ter		<u> </u>		<u> </u>			<u> </u>	<u> </u>		I	. ,
· -	188.31	197.78	177.31	173.77	155.29	149.16	163.65	163.35	183.86	194.39	208.5]	
` /							<u></u> Οι	I itput from w	ater heate	I r (annual)₁	12	2169	(64)
Heat gains from	n water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)	ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 94.84	84.12	89.57	82	81.59	74.67	73.4	78.22	77.35	84.94	87.68	93.14	اُ	(65)
include (57)m	n in calc	culation (of (65)m	only if c	vlinder i	s in the o	dwellin	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal gai			` ′		,						,		
Metabolic gains	` `			, ·									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 137.99	137.99	137.99	137.99	137.99	137.99	137.99	137.99	+	137.99	137.99	137.99		(66)
Lighting gains (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5	•	•	•	1	
(67)m= 24.66	21.91	17.81	13.49	10.08	8.51	9.2	11.95	16.05	20.37	23.78	25.35		(67)
Appliances gair	ns (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5			1	
· · · — — —	262.69	255.89	241.42	223.15	205.98	194.51	191.81		213.08	231.35	248.52		(68)
Cooking gains (calcula)	ted in A	pendix	L, equat	ion L15	or L15a), also	see Table	5			1	
(69)m= 36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8		(69)
Pumps and fan:	s gains	(Table 5	īa)									1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. eva	aporatio	n (nega	ive valu	es) (Tab	le 5)	•	•	•	•	•	•	•	
(71)m= -110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39]	(71)
Water heating g	gains (T	able 5)		•		•	•	•	•	•	•	•	
(72)m= 127.48	125.17	120.39	113.88	109.66	103.71	98.66	105.14	107.44	114.17	121.77	125.18		(72)
Total internal	gains =				(66)m + (67)m	n + (68)m	ı + (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 479.53	477.17	461.49	436.19	410.29	385.6	369.76	376.29	389.48	415.02	444.3	466.45		(73)
6. Solar gains:						•	•	•	•	•	•		
Solar gains are ca	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to the	ne applicat	ole orientat	tion.		
Orientation: A		actor	Area		Flu			g_ Table 65	_	FF		Gains	
_	able 6d		m²		Ta	ble 6a	. –	Table 6b	_ '	able 6c		(W)	_
Northeast _{0.9x}	0.54	X	6.5	58	х	11.28	x	0.63	x	0.7	=	15.91	(75)
Northeast _{0.9x}	0.54	X	3.1	7	х	11.28	x	0.63	x	0.7	=	7.67	(75)
Northeast _{0.9x}	0.54	X	6.5	58	x	22.97	X	0.63	x	0.7	=	32.39	(75)
Northeast _{0.9x}	0.54	X	3.1	7	x	22.97	X	0.63	x	0.7	=	15.6	(75)
Northeast _{0.9x}	0.54	X	6.5	58	X .	11.38	X	0.63	Х	0.7	=	58.36	(75)

		,				,				,		_
Northeast _{0.9x}	0.54	X	3.17	X	41.38	X	0.63	X	0.7	=	28.11	(75)
Northeast _{0.9x}	0.54	X	6.58	X	67.96	X	0.63	X	0.7	=	95.84	(75)
Northeast _{0.9x}	0.54	X	3.17	X	67.96	X	0.63	X	0.7	=	46.17	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.35	X	0.63	X	0.7	=	128.82	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.35	X	0.63	X	0.7	=	62.06	(75)
Northeast _{0.9x}	0.54	X	6.58	X	97.38	X	0.63	X	0.7	=	137.34	(75)
Northeast 0.9x	0.54	X	3.17	x	97.38	X	0.63	X	0.7	=	66.16	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.1	X	0.63	X	0.7	=	128.48	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.1	X	0.63	X	0.7	=	61.9	(75)
Northeast 0.9x	0.54	X	6.58	x	72.63	X	0.63	X	0.7] =	102.42	(75)
Northeast _{0.9x}	0.54	X	3.17	x	72.63	x	0.63	x	0.7	=	49.34	(75)
Northeast _{0.9x}	0.54	X	6.58	x	50.42	X	0.63	x	0.7	=	71.11	(75)
Northeast _{0.9x}	0.54	X	3.17	x	50.42	X	0.63	x	0.7	=	34.26	(75)
Northeast _{0.9x}	0.54	X	6.58	x	28.07	X	0.63	x	0.7	=	39.58	(75)
Northeast _{0.9x}	0.54	X	3.17	x	28.07	X	0.63	x	0.7	=	19.07	(75)
Northeast _{0.9x}	0.54	X	6.58	x	14.2	X	0.63	X	0.7	=	20.02	(75)
Northeast _{0.9x}	0.54	X	3.17	x	14.2	X	0.63	X	0.7	=	9.65	(75)
Northeast _{0.9x}	0.54	X	6.58	x	9.21	X	0.63	X	0.7	=	12.99	(75)
Northeast _{0.9x}	0.54	X	3.17	x	9.21	X	0.63	x	0.7	=	6.26	(75)
Southwest _{0.9x}	0.54	X	1.05	x	36.79		0.63	X	0.7	=	16.56	(79)
Southwest _{0.9x}	0.54	X	3.29	х	36.79		0.63	x	0.7	=	51.89	(79)
Southwest _{0.9x}	0.54	X	1.05	x	62.67	ĺ	0.63	x	0.7] =	28.21	(79)
Southwest _{0.9x}	0.54	X	3.29	x	62.67		0.63	x	0.7] =	88.39	(79)
Southwest _{0.9x}	0.54	X	1.05	х	85.75		0.63	x	0.7	=	38.6	(79)
Southwest _{0.9x}	0.54	X	3.29	x	85.75		0.63	x	0.7] =	120.93	(79)
Southwest _{0.9x}	0.54	X	1.05	x	106.25		0.63	X	0.7	=	47.82	(79)
Southwest _{0.9x}	0.54	X	3.29	x	106.25		0.63	x	0.7	=	149.84	(79)
Southwest _{0.9x}	0.54	X	1.05	x	119.01		0.63	X	0.7	=	53.56	(79)
Southwest _{0.9x}	0.54	X	3.29	х	119.01		0.63	X	0.7	=	167.84	(79)
Southwest _{0.9x}	0.54	X	1.05	x	118.15		0.63	x	0.7	=	53.18	(79)
Southwest _{0.9x}	0.54	X	3.29	x	118.15		0.63	x	0.7	=	166.62	(79)
Southwest _{0.9x}	0.54	X	1.05	x	113.91		0.63	X	0.7	=	51.27	(79)
Southwest _{0.9x}	0.54	X	3.29	х	113.91		0.63	x	0.7	=	160.64	(79)
Southwest _{0.9x}	0.54	X	1.05	x	104.39		0.63	x	0.7] =	46.98	(79)
Southwest _{0.9x}	0.54	X	3.29	x	104.39		0.63	x	0.7] =	147.22	(79)
Southwest _{0.9x}	0.54	X	1.05	x	92.85		0.63	x	0.7] =	41.79	(79)
Southwest _{0.9x}	0.54	X	3.29	x	92.85		0.63	x	0.7	j =	130.95	(79)
Southwest _{0.9x}	0.54	X	1.05	х	69.27		0.63	x	0.7] =	31.18	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27		0.63	x	0.7] =	97.69	(79)
Southwest _{0.9x}	0.54	X	1.05	х	44.07]	0.63	x	0.7	j =	19.84	(79)
Southwest _{0.9x}	0.54	X	3.29	х	44.07		0.63	x	0.7] =	62.15	(79)
_		_		-		-		-		-		

Southwest _{0.9x}	0.54	x	1.0)5	x 3	31.49	1 [0.63	x	0.7	=	14.17	(79)
Southwest _{0.9x}	0.54	x	3.2	29	x 3	31.49	Ī	0.63	_ x [0.7	_ =	44.41	(79)
_													_
Solar <u>g</u> ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m			_	
83)m= 92.03	164.59	246	339.67	412.29	423.3	402.28	345.97	278.1	187.51	111.65	77.83		(83)
Fotal gains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts	,			,		•	
84)m= 571.56	641.75	707.49	775.86	822.57	808.9	772.04	722.26	667.58	602.53	555.95	544.28		(84)
7. Mean inter	nal temp	perature	(heating	season)								
Temperature	during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)							_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
86)m= 1	1	0.99	0.96	0.86	0.67	0.49	0.55	0.82	0.98	1	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)	-	-	-	•	
37)m= 20.11	20.23	20.43	20.69	20.89	20.98	21	21	20.94	20.68	20.35	20.08]	(87)
Temperature	during h	neating n	ariade ir	rest of	dwelling	from Ta	hla 0 T	h2 (°C)	!	•	Į.	J	
88)m= 20.19	20.19	20.19	20.2	20.2	20.21	20.21	20.21	20.21	20.2	20.2	20.19	1	(88)
,		<u> </u>		ļ		<u> </u>	<u> </u>					J	, ,
Utilisation fac	tor for g			welling, 0.82	h2,m (se 0.59	0.41	9a) 0.46	0.75	0.96	1 1	1	1	(89)
		0.99	0.95	<u> </u>		<u> </u>	ļ	0.75	<u> </u>		']	(00)
Mean interna				i	- ` `	1	i 			1	i	1	
90)m= 18.98	19.16	19.45	19.83	20.1	20.2	20.21	20.21	20.16	19.83	19.34	18.95		(90) —
								1	rla = Livin	ng area ÷ (4	4) =	0.47	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2				_	
92)m= 19.51	19.67	19.91	20.24	20.48	20.57	20.58	20.58	20.53	20.23	19.82	19.49		(92)
Apply adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate		1	1	
93)m= 19.51	19.67	19.91	20.24	20.48	20.57	20.58	20.58	20.53	20.23	19.82	19.49		(93)
8. Space hea													
Set Ti to the I					ned at st	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-cal	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisation fac	ļ		•	ividy	l oun	<u> </u>	_ /tug	_ <u> </u>	1 001	1400	_ <u></u>	J	
94)m= 1	0.99	0.98	0.95	0.84	0.63	0.45	0.5	0.78	0.96	0.99	1]	(94)
Useful gains,	hmGm	, W = (94	1)m x (8	4)m	l	1			ļ		ļ	ı	
95)m= 570.15	638.22	696.75	734.98	687.45	508.89	345.84	361.47	521.51	581.07	552.74	543.28	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	e for mea	an intern	al tempe	erature,	Lm , W :	=[(39)m	x [(93)m	– (96)m]	-		<u>.</u>	
97)m= 1363.51	1320.1	1196.34	999.65	772.19	520.14	346.96	363.65	562.56	847.62	1123.98	1357.25		(97)
Space heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	•	•	
98)m= 590.26	458.22	371.7	190.56	63.05	0	0	0	0	198.31	411.29	605.59		_
							Tota	ıl per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2888.98	(98)
Space heatin	g require	ement in	kWh/m²	² /year								28.24	(99)
a. Energy red	quir <u>emer</u>	nts – Indi	vid <u>ual h</u>	eating s	vstems i	ncluding	micro-C	CHP)					
Space heatir													
Fraction of sp	•	at from se	econdar	y/supple	mentary	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) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating	system	າ, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)	0			0	100.01	444.00	005.50	1	
590.26 458.22 371.7 190.56 63.05	0	0	0	0	198.31	411.29	605.59		(044)
$ (211) m = \{ [(98) m x (204)] \} x 100 \div (206) $	0	0	0	0	212.09	439.88	647.69	1	(211)
[55:25] 1556 55:15 2505 5:15	Ţ.	, and the second				211),5,1012		3089.81	(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	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating Output from water heater (calculated above)									
213.64 188.31 197.78 177.31 173.77	155.29	149.16	163.65	163.35	183.86	194.39	208.5]	
Efficiency of water heater								79.8	(216)
(217)m= 87.39 87.1 86.47 85.01 82.39	79.8	79.8	79.8	79.8	85.02	86.77	87.5		(217)
Fuel for water heating, kWh/month									
(219) m = (64) m x $100 \div (217)$ m								7	
(219)m= 244.48 216.2 228.71 208.59 210.9	194.6	186.91	205.07	204.7	216.27	224.04	238.3		
(219)m= 244.48 216.2 228.71 208.59 210.9	194.6	186.91		204.7 I = Sum(2		224.04	238.3	2578.77	(219)
Annual totals	194.6	186.91			19a) ₁₁₂ =	224.04 Wh/year	<u>I</u>	2578.77 kWh/yea i	
	194.6	186.91			19a) ₁₁₂ =		<u>I</u>		
Annual totals	194.6	186.91			19a) ₁₁₂ =		<u>I</u>	kWh/yeai	
Annual totals Space heating fuel used, main system 1		186.91			19a) ₁₁₂ =		<u>I</u>	kWh/yeai 3089.81	
Annual totals Space heating fuel used, main system 1 Water heating fuel used		186.91			19a) ₁₁₂ =		<u>I</u>	kWh/yeai 3089.81	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot		186.91			19a) ₁₁₂ =			kWh/yeai 3089.81	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:		186.91	Tota		19a) ₁₁₂ = k 1	Wh/year	30	kWh/yeai 3089.81	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue		186.91	Tota	I = Sum(2	19a) ₁₁₂ = k 1	Wh/year	30	kWh/yeai 3089.81 2578.77	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Tota	I = Sum(2: of (230a).	19a) ₁₁₂ = k 1	Wh/year	30	kWh/yeai 3089.81 2578.77	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ms inclu	uding mi	Tota	I = Sum(2: of (230a).	19a) ₁₁₂ = k 1	Wh/year	30 45	kWh/yeai 3089.81 2578.77 75 435.56	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ms inclu	uding mi	Tota	I = Sum(2: of (230a).	19a) ₁₁₂ = k¹(230g) =	Wh/year	30 45	kWh/year 3089.81 2578.77 75 435.56	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	ms inclu En kW	uding mi	Tota	I = Sum(2: of (230a).	(230g) =	Wh/year	30 45	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	ms inclu En kW (211	uding mi ergy /h/year	Tota	I = Sum(2: of (230a).	(230g) = Emiss kg CO:	ion fac 2/kWh	30 45	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/year	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ms inclu En kW (214 (218	uding mi ergy /h/year	Tota	I = Sum(2: of (230a).	(230g) = Emiss kg CO: 0.5	ion fac 2/kWh	30 45 tor =	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4	(230c) (230e) (231) (232) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ms inclu En kW (211 (218 (218	uding midergy /h/year	sum	I = Sum(2:	(230g) = Emiss kg CO:	ion fac 2/kWh	30 45 tor	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4 0	(230c) (230e) (231) (232) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	ms inclu En kW (211 (215 (215 (262	uding midergy /h/year 1) × 5) × 2) × 1) + (262)	Tota	I = Sum(2:	(230g) = Emiss kg CO: 0.5	ion fac 2/kWh	30 45 tor = =	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4 0 557.01	(230c) (230e) (231) (232) (232) (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ms inclu En kW (211) (215) (261) (261)	uding midergy /h/year	sum	I = Sum(2:	(230g) = Emiss kg CO: 0.5	ion fac 2/kWh	30 45 tor =	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4 0	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1489.39 (272)

TER = 14.56 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:09

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 81.5m2

Site Reference: **Plot Reference:** 4_05 - 1B2P **Tottenham Mews**

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

17.86 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 19.98 kg/m² Fail

Excess emissions = 2.12 kg/m² (11.9 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 54.4 kWh/m²

Excess energy = $4.66 \text{ kg/m}^2 (09.4 \%)$

2 Fabric U-values

Average	Highest	
0.20 (max. 0.30)	0.20 (max. 0.70)	OK
(no floor)		
0.23 (max. 0.20)	0.23 (max. 0.35)	Fail
1.10 (max. 2.00)	1.10 (max. 3.30)	OK
	0.20 (max. 0.30) (no floor) 0.23 (max. 0.20)	0.20 (max. 0.30)

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Measured cylinder loss: 2.24 kWh/day Hot water Storage:

Permitted by DBSCG: 2.24 kWh/day

OK Primary pipework insulated: Yes

Fail

OK

OK

Regulations Compliance Report

Space heating controls Hot water controls:	Charging system linked to Cylinderstat	o use of community heating, programi	mer and TRVs OK OK
Low energy lights	- Cymraene ar		
Percentage of fixed lights with	low-energy fittings	100.0%	
Minimum	5, 5	75.0%	OK
Mechanical ventilation			
Continuous supply and extract	t system		
Specific fan power:	•	0.48	
Maximum		1.5	OK
MVHR efficiency:		78%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames val	ley):	Slight	OK
sed on:			
Overshading:		Average or unknown	
Windows facing: North East		4.7m²	
Windows facing: South West		6.58m²	
Windows facing: South West		2.1m²	
Ventilation rate:		6.00	
Blinds/curtains:		Dark-coloured curtain or ro	oller blind
		Closed 100% of daylight h	ours
0 Key features			
Air permeablility		3.0 m³/m²h	
Windows U-value		1.1 W/m ² K	

Community heating, heat from boilers - mains gas

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	- 036 F1	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.5.12	
A 1.1	į.	Property	Address	: 4_05 -	1B2P				
Address: 1. Overall dwelling dime	ensions:								
1. Overall aweiling aime	, , , , , , , , , , , , , , , , , , ,	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		.65	(2a) =	215.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	81.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	215.98	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	x 4	10 =	0	(6a)
Number of open flues	0 + 0	- +	0		0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x 1	10 =	0	(7a)
Number of passive vents	3			F	0	x 1	10 =	0	(7b)
Number of flueless gas f	ires			F	0	x 4	10 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)
Number of storeys in t	peen carried out or is intended, proced he dwelling (ns)	ed to (17),	otnerwise (continue ti	rom (9) to	(16)		0	(9)
Additional infiltration	ine arraining (ine)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
**	resent, use the value corresponding t	o the grea	ter wall are	a (after			!		
deducting areas of openia	ngs);).1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(000	July, 5.55	00.				0	(13)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	ea		(20) = 1 -	[0.075 x (′	19)] =			0.7	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		-71			0.7	(21)
Infiltration rate modified f			, , ,	, , ,				0.1	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	1 -					ı	
(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 (OC.)	0) 4	•	•	•	•	-		•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1 1	1.08	1.12	1.18]	
(220)111= 1.21 1.20	1.20 1.1 1.00 0.95	0.95	0.92		1.00	1.12	1.10	J	

Adjusted infiltra		<u>`</u>				` 	`´	`´	I	l	T	1	
0.13 Calculate effec	0.13 ctive air	0.13 change i	0.12 rate for t	0.11 he appli	0.1 Cable ca	0.1 S e	0.1	0.1	0.11	0.12	0.12]	
If mechanica		•		ie appii	00.070 00.							0.5	(23
If exhaust air he	eat pump	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	or in-use f	actor (fron	n Table 4h) =				66.3	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	overy (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 h				•	•								
if (22b)n		<u> </u>	· ·	, ,			ŕ	ŕ –	· ` ·		1	1	(0
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n				•	•				0.51				
24d)m= 0	0	0	0	0	0	0	0.5 + [(2	0	0.01	0	0	1	(24
Effective air												J	•
25)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29	1	(25
0.0	0.0	0.0	0.20	0.20	0.27	0.27	0.27	0.27	0.20	0.20	0.20	J	(
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros area	-	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
Vindows Type		(111-)	111		4.7		۷۷/۱۱۱ <u>۷</u> +(1.1)/[]/		4.95		KJ/III	IX.	(27
Vindows Type Vindows Type						_	/[1/(1.1)+			\dashv			•
Vindows Type Vindows Type					3.29	_			3.47	=			(27
• •		. 1			1.05		/[1/(1.1)+		1.11	륵 ,			(27
Valls Type1	50.4		13.38	3	37.02	=	0.2	=	7.4	닠 ¦		- -	(29
Valls Type2	20.4	_	0	_	20.4	×	0.19	=	3.78	닠 !			(29
Roof	81.		0		81.5	X	0.23	=	18.75	[(30
otal area of e					152.3								(31
for windows and * include the area						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	h 3.2	
abric heat los				o ana pan			(26)(30)) + (32) =				44.02	2 (33
leat capacity		•	-,					((28).	(30) + (32	2) + (32a).	(32e) =	733.5	
hermal mass	`	,	o = Cm ÷	- TFA) ir	n kJ/m²K				tive Value	, , ,	(= -)	100	(35
or design assess	•	•		•			ecisely the				able 1f	100	(00
an be used inste						,	,						
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						22.85	(36
details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =			66.87	(37
entilation hea	at loss ca		l monthly						= 0.33 × (25)m x (5)) 	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 21.55	21.36	21.18	20.24	20.05	19.12	19.12	18.93	19.49	20.05	20.43	20.8]	(38
leat transfer o	coefficier	nt, W/K			_			(39)m	= (37) + (3	38)m		-	
39)m= 88.42	88.23	88.05	87.11	86.92	85.99	85.99	85.8	86.36	86.92	87.3	87.67		
									Δ	Sum(39) ₁	140	87.06	39 (39

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.08	1.08	1.08	1.07	1.07	1.06	1.06	1.05	1.06	1.07	1.07	1.08		
				l .			l .		Average =	Sum(40) ₁	12 /12=	1.07	(40)
Number of day	<u> </u>	nth (Tab	le 1a)		1	ı		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 requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		49		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target c		3.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea			ctor from	Table 1c x		! '	!	!			
(44)m= 102.69	98.96	95.22	91.49	87.75	84.02	84.02	87.75	91.49	95.22	98.96	102.69		
		•		!			!			ım(44) ₁₁₂ =	L	1120.25	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,ı	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 152.29	133.19	137.44	119.82	114.97	99.21	91.94	105.5	106.76	124.42	135.81	147.48		_
If instantaneous v	vater heati	na at noint	of use (no	n hot water	r storage)	enter () in	hoves (46		Total = Su	ım(45) ₁₁₂ =	- [1468.83	(45)
	i		·				· · ·	, , , I	1,000	00.07	00.40		(46)
(46)m= 22.84 Water storage	19.98 loss:	20.62	17.97	17.25	14.88	13.79	15.82	16.01	18.66	20.37	22.12		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110) litres in	(47)						
Otherwise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					(1.14.11								
a) If manufact				or is kno	wn (kVVI	n/day):				2.	24		(48)
Temperature f										0	.6		(49)
Energy lost from b) If manufact		•			or io not		(48) x (49)) =		1.	34		(50)
Hot water stor			-								0		(51)
If community h	-			•		,							` '
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								1.	34		(55)
Water storage	loss cal	culated t	for each	month	_		((56)m = ((55) × (41)	m				
(56)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Appendi	хН	
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	t 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	olar wa	ter 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)

O		f.,		(04)	(00) - 0	OF (44)	١						
Combi loss cal	culated 0	for each	montn ((61)m =	(60) ÷ 3	05 × (41))m 0	0	0	0	0		(61)
				<u> </u>				<u> </u>	<u> </u>		<u> </u>	(F0)m + (G1)m	(01)
Total heat requ (62)m= 217.21	191.83	202.37	182.66	179.9	162.05	156.86	170.42	·	189.34	198.64	212.41	(59)111 + (61)111	(62)
Solar DHW input c				l		<u> </u>							(02)
(add additional									ir contribu	iion io waie	er neaung)		
(63)m= 0	0	0	0	0	0	0	0	To	0	0	0		(63)
Output from wa													, ,
(64)m= 217.21	191.83	202.37	182.66	179.9	162.05	156.86	170.42	169.59	189.34	198.64	212.41		
` '							Οι	t tput from w	ater heate	. I er (annual)₁	112	2233.28	(64)
Heat gains fror	n water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)	ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 102.58	91.2	97.64	90.11	90.17	83.25	82.51	87.02	85.76	93.31	95.42	100.98	ĺ	(65)
include (57)r	n in calc	culation o	of (65)m	only if c	vlinder i	s in the o	dwellin	or hot w	/ater is f	rom com	ımunitv h	ı ıeatina	
5. Internal ga					,						,		
Metabolic gains	Ì			, ·									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	+	124.54	124.54	124.54		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		•	•	l	
(67)m= 20.93	18.59	15.12	11.45	8.56	7.22	7.81	10.15	13.62	17.29	20.18	21.51		(67)
Appliances gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5	.		ı	
(68)m= 222.55	224.86	219.04	206.65	191.01	176.31	166.49	164.18		182.39	198.03	212.73		(68)
Cooking gains	(calcula	ted in A	pendix	L, equat	ion L15	or L15a), also s	see Table	5			l	
(69)m= 35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45		(69)
Pumps and far	ns gains	(Table 5	īa)					<u> </u>				ı	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (nega	ive valu	es) (Tab	le 5)	•	•	•		•	•	•	
(71)m= -99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63		(71)
Water heating	gains (T	able 5)		•		•	•	•	•	•	•	•	
(72)m= 137.87	135.71	131.24	125.15	121.2	115.63	110.9	116.96	119.11	125.42	132.53	135.72		(72)
Total internal	gains =				(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	•	
(73)m= 441.71	439.52	425.75	403.6	381.12	359.53	345.56	351.65	363.09	385.46	411.1	430.32		(73)
6. Solar gains	t .					•	•	•	,	,	•		
Solar gains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to the	ne applical	ole orienta	tion.		
Orientation: A		actor	Area		Flu			g_ T-1-1-01-	-	FF		Gains	
	able 6d		m²			ble 6a	_	Table 6b	_	able 6c		(W)	_
Northeast _{0.9x}	0.54	X	4.	7	X ·	11.28	x	0.44	X	8.0	=	9.07	(75)
Northeast _{0.9x}	0.54	X	4.	7	X	22.97	x	0.44	X	0.8	=	18.47	(75)
Northeast _{0.9x}	0.54	X	4.	7	X	11.38	х	0.44	x	0.8	=	33.27	(75)
Northeast _{0.9x}	0.54	Х	4.	7	x (67.96	x	0.44	X	0.8	=	54.64	(75)
Northeast _{0.9x}	0.54	X	4.	7	X 9	91.35	x	0.44	X	0.8	=	73.45	(75)

Northeast _{0.9x}	0.54	x	4.7	1 x	97.38	7 x	0.44	コ x [0.8		78.3	(75)
Northeast 0.9x	0.54	^ x	4.7] ^] x	91.1	」^] ×	0.44	_ ^	0.8		73.25	(75)
Northeast _{0.9x}	0.54	l ^	4.7] ^] x	72.63	」 ^] x	0.44	^ L □	0.8		58.39	(75)
Northeast _{0.9x}	0.54	x	4.7] ^] _x	50.42	」 ^] x	0.44	^ L □ x [0.8		40.54	(75)
Northeast _{0.9x}	0.54	X	4.7] x	28.07] x	0.44		0.8		22.57	(75)
Northeast _{0.9x}	0.54	X	4.7	X	14.2] x	0.44	x [0.8		11.41	(75)
Northeast 0.9x	0.54	X	4.7	X	9.21] x	0.44		0.8		7.41	(75)
Southwest _{0.9x}	0.54	X	3.29]]	36.79	<u> </u> 	0.44		0.8		41.42	(79)
Southwest _{0.9x}	0.54	X	1.05]]	36.79	1	0.44		0.8	_	13.22	(79)
Southwest _{0.9x}	0.54	X	3.29]] _X	62.67	1	0.44		0.8	= -	70.55	(79)
Southwest _{0.9x}	0.54	X	1.05]] _X	62.67	i	0.44		0.8	=	22.52	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75	1	0.44		0.8	= =	96.53	(79)
Southwest _{0.9x}	0.54	X	1.05	X	85.75	i	0.44		0.8	= =	30.81	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25	1	0.44		0.8	_ =	119.6	(79)
Southwest _{0.9x}	0.54	X	1.05	X	106.25	i	0.44		0.8	=	38.17	(79)
Southwest _{0.9x}	0.54	X	3.29	X	119.01	i	0.44		0.8		133.96	(79)
Southwest _{0.9x}	0.54	x	1.05	X	119.01	i	0.44	x [0.8	=	42.75	(79)
Southwest _{0.9x}	0.54	X	3.29	X	118.15	1	0.44	x [0.8	=	133	(79)
Southwest _{0.9x}	0.54	х	1.05	X	118.15	i	0.44		0.8	=	42.45	(79)
Southwest _{0.9x}	0.54	х	3.29	X	113.91	Ī	0.44	_ x [0.8	=	128.22	(79)
Southwest _{0.9x}	0.54	х	1.05	X	113.91	i	0.44		0.8	=	40.92	(79)
Southwest _{0.9x}	0.54	х	3.29	X	104.39	Ī	0.44		0.8		117.51	(79)
Southwest _{0.9x}	0.54	x	1.05	X	104.39	Ī	0.44	= x [0.8		37.5	(79)
Southwest _{0.9x}	0.54	х	3.29	X	92.85	Ī	0.44		0.8		104.52	(79)
Southwest _{0.9x}	0.54	х	1.05	X	92.85	Ī	0.44	_ x [0.8	_ =	33.36	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27	Ī	0.44	x	0.8	=	77.97	(79)
Southwest _{0.9x}	0.54	x	1.05	X	69.27	Ī	0.44	_ x [0.8	=	24.88	(79)
Southwest _{0.9x}	0.54	x	3.29	X	44.07	Ī	0.44	_ x [0.8	=	49.61	(79)
Southwest _{0.9x}	0.54	x	1.05	X	44.07	Ī	0.44	= x [0.8	=	15.83	(79)
Southwest _{0.9x}	0.54	x	3.29	X	31.49	Ī	0.44	= x [0.8	<u> </u>	35.44	(79)
Southwest _{0.9x}	0.54	x	1.05	X	31.49	Ī	0.44	_ x [0.8	=	11.31	(79)
				•		_						
Solar gains in wat	ts, calcula	ated	for each mon	th		(83)n	n = Sum(74)m .	(82)m				
` '	1.53 160		212.41 250.1		253.74 242.39	21:	3.4 178.42	125.42	76.86	54.17		(83)
Total gains – inter		_	` 	_	<u> </u>	_					l	
(84)m= 505.42 55	1.05 586	.36	616.02 631.2	9 (513.27 587.95	565	5.05 541.51	510.88	487.96	484.49		(84)
7. Mean internal	temperati	ure (heating seaso	on)								
Temperature dur	ing heatir	ng pe	eriods in the li	ving	area from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation factor	for gains	for li	ving area, h1,	m (s	see Table 9a)						ı	
	_	ar	Apr Ma	_	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.96 0.	.95 0.9	3	0.89 0.82		0.69 0.56	0.5	59 0.77	0.9	0.95	0.97		(86)
Mean internal ter	nperature	in li	ving area T1	(foll	ow steps 3 to	7 in 7	able 9c)					
(87)m= 18.78 18	3.99 19.3	36	19.86 20.34		20.72 20.89	20.	86 20.59	19.99	19.31	18.74		(87)

T		al		المالمالية		al a III a a	f T.	.b.l. 0 T	LO (0 0)					
(88)m=	20.01	20.02	eating p	20.03	20.03	20.04	20.04	20.04	20.03	20.03	20.02	20.02		(88)
` '			ains for				ļ		20.03	20.03	20.02	20.02		(00)
(89)m=	0.96	0.94	0.92	0.87	0.78	0.63	0.46	0.5	0.71	0.88	0.94	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 1	r 7 in Tabl	e 9c)				
(90)m=	17.04	17.34	17.88	18.6	19.26	19.76	19.96	19.94	19.61	18.8	17.81	16.99		(90)
									1	LA = Livin	g area ÷ (4	1) =	0.49	(91)
Mean	interna	ıl temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	.A) × T2			L		_
(92)m=	17.89	18.15	18.6	19.22	19.79	20.23	20.41	20.39	20.09	19.38	18.55	17.85		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	17.89	18.15	18.6	19.22	19.79	20.23	20.41	20.39	20.09	19.38	18.55	17.85		(93)
•		·	uirement											
			ernal ter or gains			ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.94	0.93	0.9	0.85	0.77	0.64	0.5	0.54	0.72	0.86	0.92	0.95		(94)
		1	, W = (94					i	i	i				4
(95)m=	476.17	510.65	527.89	524.65	486.44	393.87	295.3	302.58	387.96	438.44	450.03	458.98		(95)
(96)m=	aly aver	age exte	rnal tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '			an intern					<u> </u>	<u> </u>		7.1	7.2		(00)
(97)m=		1169.08			703.24	484.22	328	342.59	517.66	763.55	999.32	1196.44		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	540	442.47	400.1	269.24	161.3	0	0	0	0	241.88	395.49	548.67		_
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2999.15	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								36.8	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme								
			ace hea								unity sch	neme.	0	(301)
	-		from co	-		-	_	Table 1	., •	0110] [(302)
	•			•	•	,	•	-!! f	OUD and	4- 4			1	(302)
			y obtain ne s, geotherr							up to rour (otner neat	sources; th	ie iatter	
Fractio	n of hea	at from C	Commun	ity boiler	s								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	communi	ity heatii	ng syste	m				Ī	1.05	(306)
Space	heatin	g										•	kWh/yea	-
Annua	l space	heating	requirem	nent									2999.15	
Space	heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [3149.11	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												-		

Space heating requirement from secondary/supplem	nentary system (98	3) x (301) x 100 ÷	(308) =		0	(309)
Water heating						_
Annual water heating requirement					2233.28	
If DHW from community scheme: Water heat from Community boilers	(64	1) x (303a) x (305) x (306) =		2344.95	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) +	(310a)(310e	e)] =	54.94	(313)
Cooling System Energy Efficiency Ratio				Ē	0	(314)
Space cooling (if there is a fixed cooling system, if n	ot enter 0) = (107) ÷ (314) =		Ē	0	(315)
Electricity for pumps and fans within dwelling (Table mechanical ventilation - balanced, extract or positive					158.09	(330a)
warm air heating system fans				Ë	0	(330b)
pump for solar water heating				F	0	(330g)
Total electricity for the above, kWh/year	=(3	330a) + (330b) + ((330g) =		158.09	(331)
Energy for lighting (calculated in Appendix L)				Ē	369.64	(332)
401 000 Fair-ian 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						
12b. CO2 Emissions – Community heating scheme						
12b. CO2 Emissions – Community heating scheme	Energ kWh/y	•	nission fac CO2/kWh		missions ı CO2/year	
CO2 from other sources of space and water heating	kWh/y	ear kg	CO2/kWh	kg		(367a)
CO2 from other sources of space and water heating	kWh/y	ear kg	CO2/kWh	kg	CO2/year](367a)](367)
CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	kWh/y (not CHP) re is CHP using two fuels rep	ear kg	CO2/kWh	kg	89.5	
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1	kWh/y (not CHP) re is CHP using two fuels rep [(307b)+(310b)] x 100	ear kg eat (363) to (366 ÷ (367b) x) for the secon	kg	89.5 1325.94	(367)
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/y (not CHP) re is CHP using two fuels rep [(307b)+(310b)] x 100 [(313) x	ear kg eat (363) to (366 ÷ (367b) x) for the secon	kg and fuel	89.5 1325.94 28.51	(367)
CO2 from other sources of space and water heating Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/y (not CHP) re is CHP using two fuels rep [(307b)+(310b)] x 100 [(313) x (363)(366) - (309) x	ear kg eat (363) to (366 ÷ (367b) x + (368)(372)	0.22 0.52	kg nd fuel = =	89.5 1325.94 28.51 1354.45	(367) (372) (373)
CO2 from other sources of space and water heating 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)	(307b)+(310b)] x 100 [(313) x (363)(366) - (309) x or instantaneous heater	ear kg eat (363) to (366 ÷ (367b) x + (368)(372)	0.22 0.52	kg nd fuel = = =	89.5 1325.94 28.51 1354.45	(367) (372) (373) (374)
CO2 from other sources of space and water heating 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 of	(373) + (374)	ear kg eat (363) to (366 ÷ (367b) x + (368)(372)	0.22 0.52	kg nd fuel = = =	89.5 1325.94 28.51 1354.45 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating 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 of total CO2 associated with space and water heating	(373) + (374)	ear kg eat (363) to (366 ÷ (367b) x + (368)(372)	0.22 0.52 0	kg nd fuel	89.5 1325.94 28.51 1354.45 0 0	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating 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 of total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans of the control of the c	(307b)+(310b)] x 100 [(313) x (363)(366) - (309) x or instantaneous heater (373) + (374) - within dwelling (331)) x (332))) x	ear kg eat (363) to (366 ÷ (367b) x + (368)(372)	0.22 0.52 0.52	kg nd fuel	89.5 1325.94 28.51 1354.45 0 0 1354.45 82.05	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating 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 of the control of the	(307b)+(310b)] x 100 [(313) x (363)(366) - (309) x or instantaneous heater (373) + (374) - within dwelling (331)) x (332))) x	ear kg eat (363) to (366 ÷ (367b) x + (368)(372)	0.22 0.52 0.52	kg nd fuel	89.5 1325.94 28.51 1354.45 0 0 1354.45 82.05	(367) (372) (373) (374) (375) (376) (378) (379)

			User D	Notaile:						
	\". F = T		USELL					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 20 ⁷	12		Strom Softwa					018096 on: 1.0.5.12	
Software Hame.	Stroma i S/ti 20		operty	Address				VCISIC	71. 1.0.0.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	7(0-)	Volume(m ³	<u>-</u>
	\	\			(1a) x	2	2.65	(2a) =	215.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	81.5	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	(3n) =	215.98	(5)
2. Ventilation rate:	main s	econdary	v	other		total			m³ per hou	ır
N. selven of all leaves a	heating	heating	-		, –			40		_
Number of chimneys	0 +	0] +	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] + _	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	3	X '	10 =	30	(7a)
Number of passive vents	3				L	0	X	10 =	0	(7b)
Number of flueless gas fi	ires					0	X	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	6a)+(6b)+(7a	a)+(7b)+((7c) =	Г	30		÷ (5) =	0.14	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.14	(0)
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber present, use the value corres				•	ruction			0	(11)
deducting areas of openi		sponding to	irie great	ler 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, en	ter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2		_	4		0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,	· ·		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil Air permeability value applie						is boing u	end		0.39	(18)
Number of sides sheltere		is been done	e or a de	gree an pe	meability	is being u	360		4	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18	x (20) =				0.27	(21)
Infiltration rate modified f	or monthly wind spee	d								
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]	
				Ц		<u> </u>		<u> </u>	J	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32]		
Calculate effect		•	rate for t	he appli	cable ca	se				•				1,00
If exhaust air he			andiv N (2	3h) - (23s	a) × Fmv (e	auation (N	J5)) other	rwisa (23h) <i>- (</i> 23a)			0		(23a
If balanced with		•	•	, ,	,	•	,,	,) = (23a)			0](23k
a) If balance		•	•	J		`		,	2h\m ı (22h) v [1 (220)	0		(230
(24a)m= 0	0	o 0	0	0	0	0	1K) (24a	0	0	230) x [0] - 100]		(248
b) If balance					, i							J		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(24b
c) If whole h		<u> </u>			<u> </u>	<u> </u>	<u> </u>	<u> </u>				J		•
if (22b)n					•				.5 × (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(240
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft	l					
if (22b)n	n = 1, the	en (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	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]		(240
Effective air	change	rate - er	iter (24a) or (24b	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]		(25)
3. Heat losse	s and he	eat loss r	paramete	er:										
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	ΑXU		k-value	9	ΑХ	k
	area	(m²)	· m) ²	A ,r	n²	W/m2	K .	(W/	K)	kJ/m²-	K	kJ/K	
Windows Type	: 1				4.7	x1,	/[1/(1.4)+	0.04] =	6.23					(27)
Windows Type	2				3.29	x1,	/[1/(1.4)+	0.04] =	4.36					(27)
Windows Type	: 3				1.05	x1,	/[1/(1.4)+	0.04] =	1.39					(27)
Walls Type1	50.4	4	13.3	8	37.02	<u>x</u>	0.18	= [6.66					(29)
Walls Type2	20.4	4	0		20.4	Х	0.18	=	3.67					(29)
Roof	81.5	5	0		81.5	х	0.13	=	10.59			\neg		(30)
Total area of e	lements	, m²			152.3	3								- (31)
* for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2		
** include the area				ls and par	titions		(2.2)	(2.5)						,
Fabric heat los		•	U)				(26)(30)					38.6	57	(33)
Heat capacity	`	,							(30) + (32	, , ,	(32e) =	733	.5	(34)
Thermal mass	-								tive Value			250)	(35)
For design assess can be used inste				construct	ion are not	t known pr	ecisely the	indicative	values of	'IMP IN I	able 1f			
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix ł	<						7.6	 2	(36)
if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									1
Total fabric he	at loss							(33) +	(36) =			46.2	!8	(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= 39.93	39.76	39.6	38.83	38.69	38.02	38.02	37.9	38.28	38.69	38.98	39.28			(38)
Heat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m				
(39)m= 86.21	86.05	85.88	85.12	84.97	84.3	84.3	84.18	84.56	84.97	85.26	85.57			_
									Average =	Sum(39) ₁	12 /12=	85.1	2	(39)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05	ı	
` /				<u> </u>	<u> </u>	<u> </u>	<u> </u>		L Average =	Sum(40) ₁ .	12 /12=	1.04	(40)
Number of day	s in mo	nth (Tab	le 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ı	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31	ı	(41)
<u> </u>													
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	nancy	NI									40	ı	(40)
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.		49		(42)
Annual average											.35	ı	(43)
Reduce the annua	-				-	-	to achieve	a water us	se target o	r ^t			
not more that 125	ilities per	person per T	uay (ali w		TOLATIO CO							ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	ı litres pei	r day for ea	cn montn	Va,m = ta	ctor from	able 1c x	(43)					ı	
(44)m= 102.69	98.96	95.22	91.49	87.75	84.02	84.02	87.75	91.49	95.22	98.96	102.69		_
Financial and ad	h = 4= 4=			- mth-h	400 \/-/		T / 200/			m(44) ₁₁₂ =		1120.25	(44)
Energy content of	not water	usea - cai			190 x va,r		1 m / 3600	KVVN/mor			c, 1a)	ı	
(45)m= 152.29	133.19	137.44	119.82	114.97	99.21	91.94	105.5	106.76	124.42	135.81	147.48		_
If instantaneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (16		Total = Su	m(45) ₁₁₂ =	= [1468.83	(45)
									1		i 1	ı	(10)
(46)m= 22.84 Water storage	19.98	20.62	17.97	17.25	14.88	13.79	15.82	16.01	18.66	20.37	22.12		(46)
Storage volum) includin	n anv so	olar or W	/WHRS	storane	within sa	ame ves	امء		150	ı	(47)
If community h	` '		-			•		A1110 VOO	001		130		(47)
Otherwise if no	•			•			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage		not wate	, (a.i.o ii	.0.4400 .		.0000		0.0, 0	J. O (,			
a) If manufacti		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	65	ı	(48)
Temperature fa	actor fro	m Table	2b							0.	54	ı	(49)
Energy lost fro				ear			(48) x (49)) =			89	ı	(50)
b) If manufacti		_	-		or is not					0.	00		(00)
Hot water stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0	ı	(51)
If community h	_		on 4.3									ı	
Volume factor			0.1								0	ı	(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0	ı	(54)
Enter (50) or (54) in (5	55)								0.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66	ı	(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= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		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	ı	(59)

Combi loog o	olouloto d	for ooob	manth ((64)m	(60) · 2(SE (41)	١,,,,						
Combi loss of (61)m= 0	alculated	or each	month (0 1)m =	(60) ÷ 30	05 × (41)	0	Ιο	0	Ιο	0]	(61)
		ļ					<u> </u>	ļ	<u> </u>	ļ		(50) == . (64) ==	(01)
(62)m= 203.2		188.37	169.11	165.9	148.5	142.86	156.42	156.04	(45)III + 175.34	185.09	198.41	(59)m + (61)m	(62)
Solar DHW inpu						<u> </u>							(02)
(add addition									ii continbut	ion to wate	er rieatiriy)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	 water hea	ter					<u> </u>	<u> </u>	<u> </u>	ļ		I	, ,
(64)m= 203.2		188.37	169.11	165.9	148.5	142.86	156.42	156.04	175.34	185.09	198.41		
						!	Out	put from w	ater heate	r (annual)₁	12	2068.44	(64)
Heat gains fi	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 ;	x [(46)m	+ (57)m	+ (59)m	1	
(65)m= 91.38		86.44	79.27	78.97	72.42	71.31	75.82	74.92	82.11	84.58	89.78]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>				•						,		
Metabolic ga	ins (Table	e 5), Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 124.5	4 124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54		(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-		-	
(67)m= 21.5 ²	19.13	15.56	11.78	8.81	7.43	8.03	10.44	14.02	17.8	20.77	22.14		(67)
Appliances of	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5		•	•	
(68)m= 222.5	5 224.86	219.04	206.65	191.01	176.31	166.49	164.18	170	182.39	198.03	212.73		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45		(69)
Pumps and f	ans gains	(Table 5	āa)					•	•	•		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)			•		•	•	•	
(71)m= -99.6	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63		(71)
Water heating	g gains (1	rable 5)				•			•		•	•	
(72)m= 122.8	2 120.66	116.18	110.09	106.14	100.58	95.85	101.91	104.06	110.36	117.48	120.67]	(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 430.2	7 428.01	414.14	391.88	369.32	347.68	333.73	339.89	351.44	373.91	399.64	418.9]	(73)
6. Solar gai	ns:							•		•			
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ 	_	FF		Gains	
	Table 6d		m²		ı aı	ble 6a		able 6b	_ '	able 6c		(W)	
Northeast 0.9		X	4.	7	x 1	1.28	X	0.63	X	0.7	=	11.37	(75)
Northeast 0.9	0.54	X	4.	7	x 2	22.97	x	0.63	x	0.7	=	23.14	(75)
Northeast 0.9	0.54	X	4.	7	X 4	11.38	x	0.63	x	0.7	=	41.68	(75)
Northeast 0.9		Х	4.	7	x 6	67.96	x	0.63	x	0.7	=	68.45	(75)
Northeast 0.9	0.54	X	4.	7	X G	91.35	x	0.63	x	0.7	=	92.02	(75)

Northeast _{0.9x}		—		٦		٦		–				(75)
<u> </u>	0.54	X	4.7	X	97.38	X	0.63	×	0.7	=	98.1	(75)
Northeast _{0.9x}	0.54	×	4.7	」 X ¬	91.1	X	0.63	×	0.7	╡ -	91.77	(75)
<u> </u>	0.54	×	4.7	X	72.63	X	0.63	×	0.7	=	73.16	(75)
Northeast 0.9x	0.54	×	4.7	」 X ¬	50.42	X	0.63	×	0.7	=	50.79	(75)
Northeast 0.9x	0.54	×	4.7	X	28.07	X	0.63	×	0.7	=	28.27	(75)
Northeast _{0.9x}	0.54	X	4.7	X	14.2	X	0.63	X	0.7	=	14.3	(75)
Northeast 0.9x	0.54	X	4.7	X	9.21	X	0.63	×	0.7	=	9.28	(75)
Southwest _{0.9x}	0.54	X	3.29	X	36.79	_	0.63	X	0.7	=	51.89	(79)
Southwest _{0.9x}	0.54	X	1.05	X	36.79	╛	0.63	X	0.7	=	16.56	(79)
Southwest _{0.9x}	0.54	X	3.29	X	62.67	╛	0.63	X	0.7	=	88.39	(79)
Southwest _{0.9x}	0.54	X	1.05	X	62.67	_	0.63	X	0.7	=	28.21	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75	╛	0.63	x	0.7	=	120.93	(79)
Southwest _{0.9x}	0.54	X	1.05	X	85.75		0.63	X	0.7	=	38.6	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25		0.63	х	0.7	=	149.84	(79)
Southwest _{0.9x}	0.54	X	1.05	X	106.25		0.63	x	0.7	=	47.82	(79)
Southwest _{0.9x}	0.54	X	3.29	x	119.01		0.63	x	0.7	=	167.84	(79)
Southwest _{0.9x}	0.54	X	1.05	x	119.01		0.63	x	0.7	=	53.56	(79)
Southwest _{0.9x}	0.54	x	3.29	x	118.15		0.63	X	0.7	=	166.62	(79)
Southwest _{0.9x}	0.54	x	1.05	x	118.15	1	0.63	x	0.7	=	53.18	(79)
Southwest _{0.9x}	0.54	x	3.29	x	113.91	Ī	0.63	х	0.7		160.64	(79)
Southwest _{0.9x}	0.54	x	1.05	x	113.91	Ī	0.63	x	0.7	-	51.27	(79)
Southwest _{0.9x}	0.54	x	3.29	x	104.39	Ī	0.63	x	0.7	<u> </u>	147.22	(79)
Southwest _{0.9x}	0.54	x	1.05	x	104.39	Ī	0.63	x	0.7	=	46.98	(79)
Southwest _{0.9x}	0.54	x	3.29	x	92.85	Ī	0.63	x	0.7	=	130.95	(79)
Southwest _{0.9x}	0.54	x	1.05	X	92.85	Ī.	0.63	x	0.7		41.79	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27	Ī	0.63	x	0.7		97.69	(79)
Southwest _{0.9x}	0.54	x	1.05	X	69.27	Ī	0.63	x	0.7	_	31.18	(79)
Southwest _{0.9x}	0.54	×	3.29	X	44.07	i i	0.63	×	0.7	=	62.15	(79)
Southwest _{0.9x}	0.54	x	1.05	X	44.07	i i	0.63	x	0.7	=	19.84	(79)
Southwest _{0.9x}	0.54	x	3.29	X	31.49	i	0.63	x	0.7		44.41	(79)
Southwest _{0.9x}	0.54	×	1.05	X	31.49	┪	0.63	X	0.7	╡ -	14.17	(79)
_				J		_						` ′
Solar gains in v	watts, calc	culated	for each mon	ıth		(83)n	n = Sum(74)m .	(82)m				
(83)m= 79.82		201.21	266.12 313.4	_	317.9 303.68	267	7.36 223.53	157.13	96.29	67.86		(83)
Total gains – in	nternal and	d solar	(84)m = (73) r	n + (83)m , watts	•	•	•	•			
(84)m= 510.08	567.74	615.35	658 682.7	3 6	65.58 637.41	607	7.25 574.97	531.04	495.92	486.76		(84)
7. Mean interr	nal tempe	rature (heating seas	on)						-		
Temperature		,			area from Ta	ıble 9	, Th1 (°C)				21	(85)
Utilisation fact	_	•		_			` '				<u> </u>	
Jan	Feb	Mar	Apr Ma	Ť	Jun Jul	1	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.97 0.9	`	0.75 0.57	0.6		0.97	0.99	1		(86)
Mean internal	temperat	ure in li	ving area T1	(follo	w stens 3 to	7 in ⁷	Table 9c)				1	
(87)m= 19.91		20.25	20.54 20.79	`	20.95 20.99	20.		20.57	20.19	19.88		(87)
, . <u> </u>						1		<u> </u>		I	I	•

Tomp	oroturo	during h	ooting n	oriodo ir	root of	dwalling	ı from To	blo O T	h2 (°C)					
(88)m=	20.04	20.04	20.04	20.05	20.05	20.05	from Ta 20.05	20.06	20.05	20.05	20.05	20.04		(88)
Utilisa	ntion fac	tor for a	ains for i	rest of d	wellina	h2 m (se	ee Table	9a)	l		l .			
(89)m=	1	0.99	0.98	0.95	0.86	0.66	0.45	0.5	0.78	0.96	0.99	1		(89)
Mean	internal	temner	ature in	the rest	of dwelli	ina T2 (f	ollow ste	ns 3 to	r in Tahl	 e 9c)	l .			
(90)m=	18.58	18.77	19.08	19.49	19.84	20.02	20.05	20.05	19.96	19.55	18.99	18.55		(90)
` ′						<u> </u>	<u> </u>		<u> </u>	LA = Livin	g area ÷ (4	1) =	0.49	(91)
Mean	internal	tamnar	ature (fo	r the wh	ole dwe	lling) – f	LA × T1	⊥ (1 _ fl	Δ) ~ T2					
(92)m=	19.23	19.39	19.66	20.01	20.31	20.48	20.51	20.51	20.42	20.05	19.58	19.2		(92)
		nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.23	19.39	19.66	20.01	20.31	20.48	20.51	20.51	20.42	20.05	19.58	19.2		(93)
8. Spa	ace hea	ting requ	uirement											
						ned at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains			 	Ι						1	
Litilion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	tion rac	0.99	ains, hm _{0.98}	0.95	0.87	0.7	0.51	0.56	0.81	0.96	0.99	1		(94)
			, W = (9 ²			0.7	0.01	0.50	0.01	0.50	0.00	ı		(01)
(95)m=		563.24	604.56	627.06	595.51	465.84	325.42	338.89	467.18	510.64	491.68	485.16		(95)
			rnal tem	perature	from Ta	L able 8	ļ	<u> </u>	<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 I	oss rate	for mea	an intern	al tempe	erature,	Lm , W :	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1287.33	1246.98	1129.94	945.28	731.33	495.32	329.8	345.88	534.17	802.79	1064.02	1283.7		(97)
Space	e heating	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m=	579.86	459.47	390.88	229.12	101.05	0	0	0	0	217.36	412.09	594.11		_
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2983.94	(98)
Space	e heating	g require	ement in	kWh/m²	?/year								36.61	(99)
9a. En	ergy req	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatin	ıg:					J							
Fracti	on of sp	ace hea	it from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	nt from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	al heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	econda	ry/supple	ementar	y heatin	g systen	า, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space			ement (c			I.		_ 3					,	
	579.86	459.47	390.88	229.12	101.05	0	0	0	0	217.36	412.09	594.11		
(211)m	i = {[(98]	m x (20	4)] } x 1	00 ÷ (20)6)	•	•	•	•		•		I.	(211)
, ,	620.17	491.41	418.05	245.05	108.08	0	0	0	0	232.47	440.73	635.41		
								Tota	l (kWh/yea	ar) =Sum(2	211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		3191.38	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month							!	-	
= {[(98]	m x (20	1)] } x 1	00 ÷ (20	8)				•	•		•			
(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)

203.21 179.19 188.37 169.11 165.9	148.5 142.86	156.42	156.04	175.34	185.09	198.41		
Efficiency of water heater	140.0	100.42	100.04	170.04	100.00	150.41	79.8] ₍₂ ′
	79.8 79.8	79.8	79.8	85.39	86.89	87.56	79.0]_ (2′
Fuel for water heating, kWh/month								
219)m = (64)m x 100 ÷ (217)m								
219)m= 232.36 205.45 217.22 197.5 198.59 1	86.09 179.03		195.54	205.35	213.02	226.59		1
		lotal =	= Sum(2 ⁻	19a) ₁₁₂ =			2452.74	(2
Annual totals Space heating fuel used, main system 1				K\	Wh/year	· [kWh/year 3191.38	1
Vater heating fuel used						[2452.74]]
· ·							2402.14	J
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
Total electricity for the above, kWh/year		sum o	of (230a).	(230g) =			75	(2
Electricity for lighting							380.45	(2
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
				kg CO	2/kWh		kg CO2/yea	r
	kWh/year			_				-
Space heating (main system 1)	•			0.2	16	=	689.34	(2
Space heating (main system 1) Space heating (secondary)	kWh/year			0.2		=	689.34 0	(2)
	kWh/year				19	l I		,
Space heating (secondary) Vater heating	kWh/year (211) x (215) x	+ (263) + (26	64) =	0.5	19	=	0]](2
Space heating (secondary) Vater heating Space and water heating	kWh/year (211) x (215) x (219) x	+ (263) + (26	64) =	0.5	19	=	0 529.79](2](2](2
Space heating (secondary)	kWh/year (211) x (215) x (219) x (261) + (262)	+ (263) + (26	64) =	0.5	19 16 19	= [0 529.79 1219.13](2](2

TER =

(273)

17.86

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:08

Proiect Information:

Assessed By: Vitaliy Troyan (STRO018096) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 55.3m²

Site Reference: Tottenham Mews Plot Reference: 5_01 - 1B2P

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.68 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 21.19 kg/m² Fail

Excess emissions = 1.51 kg/m² (7.7 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 51.5 kWh/m²

Excess energy = $0.91 \text{ kg/m}^2 (01.8 \%)$

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day OK

Primary pipework insulated: Yes OK

Fail

OK

Regulations Compliance Report

Space heating controls		o use of community heating, program	
Hot water controls:	Cylinderstat		OK
ow energy lights			
Percentage of fixed lights wit	h low-energy fittings	100.0%	
Minimum		75.0%	OK
lechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:	•	0.48	
Maximum		1.5	OK
MVHR efficiency:		78%	
Minimum		70%	OK
ummertime temperature			
Overheating risk (Thames va	lley):	Medium	OK
ed on:			
Overshading:		Average or unknown	
Windows facing: South West		3.3m²	
Windows facing: South West		2.12m ²	
Windows facing: North West		7.28m ²	
Ventilation rate:		4.00	
Blinds/curtains:		Dark-coloured curtain or r	oller blind
		Closed 100% of daylight I	nours
Key features			
Air permeablility		3.0 m³/m²h	
Windows U-value		1.1 W/m²K	

Community heating, heat from boilers - mains gas

		llser I	Details:						
Assessor Name:	Vitaliy Troyan	— <u>USCI</u> -L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
		Property	Address	: 5_01 -	1B2P				
Address:									
1. Overall dwelling dime	ensions:	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	146.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)					
Dwelling volume				l (3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	146.55	(5)
2. Ventilation rate:									
2. Ventualion rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+ [0] = [0	x 4	10 =	0	(6a)
Number of open flues	0 + 0	- +	0		0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	x 1	10 =	0	(7a)
Number of passive vents				Ē	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			Ė	0	x 4	10 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
'	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			continue f	0		÷ (5) =	0	(8)
Number of storeys in the		50 to (11),	ourior wide (sonunae n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
deducting areas of openii	resent, use the value corresponding angs); if equal user 0.35	to the grea	ter wall are	a (arter					
•	floor, enter 0.2 (unsealed) or ().1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
-	s and doors draught stripped		0.25 - [0.2) v (1.4\ · 1	1001 -			0	(14)
Window infiltration Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es ner hø					area	3	(16)
•	lity value, then $(18) = [(17) \div 20] +$			•	ictic oi c	лисюрс	arca	0.15	(17)
•	es if a pressurisation test has been do				is being u	sed		00	(-/
Number of sides sheltered	ed							3	(19)
Shelter factor			(20) = 1 -		19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified f	 	1	Ι			N.	D	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		3.8	3.7		4.3	4.5	4.7	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.6	3.1	4	4.3	4.5	4.1	J	
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4					,		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		

0.15	0.15	e (allowi	ng for sr 0.13	0.12	a wina s	peea) = 0.11	(21a) X 0.11	(22a)m 0.12	0.12	0.13	0.14	1	
Calculate effec		l -		-		-	0.11	0.12	0.12	0.13	0.14]	
If mechanica	al ventila	ition:										0.5	(23
If exhaust air he	eat 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: effici	ency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				66.3	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
24a)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31]	(24
b) If balance	d mecha	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				•	•				- (00)	,			
if (22b)n		<u> </u>	`	•	 	,			· ` `		Ι ,	1	(0.
24c)m= 0	0	0		0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)m									0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
Effective air	change	rate - er	ter (24a	or (24h	o) or (24	c) or (24	d) in box	x (25)	Į	ļ	1	1	
25)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31	1	(25
					l		<u> </u>	<u> </u>				1	
3. Heat losse	_	·			NI a t A a		11 -1		A 37.1.1		1 -1		A 37 I
LEMENT	Gros area	-	Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Vindows Type		` ,			1.65		/[1/(1.1)+	0.04] =	1.74	,			(27
Vindows Type	2				2.12	x1	/[1/(1.1)+	0.04] =	2.23	=			(27
Vindows Type	3				3.64	x1,	/[1/(1.1)+	0.04] =	3.84	=			(27
Valls Type1	43.5	5	12.7	\neg	30.8	x	0.2		6.16	=			(29
Valls Type2	12.2		0		12.2	x	0.19	<u>-</u>	2.26	=		-	(29
Roof	55.3		0	=	55.3		0.14	╡┇	7.74	륵 ;		╡	(30
otal area of e					111	╡ ^	0.14		7.17				(31
for windows and			ffective wi	ndow U-va		 ated usind	ı formula 1	/[(1/U-valu	ie)+0.041 a	as aiven in	paragrapl	h 3.2	(0)
* include the area						ato a a.og	, , , , , , , , , , , , , , , , , , , ,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	.e g e	paragrap.	. 0.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)) + (32) =				29.54	(33
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	497.7	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35
or design assess				construct	ion are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
an be used instea Thermal bridge				icina An	nondiy k	•						40.05	
details of therma	,	•		• .	•	`						16.65	(36
otal fabric he		are not kir	own (30) =	· 0.00 x (0	'')			(33) +	(36) =			46.19	(37
entilation hea	nt 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= 15.32	15.18	15.04	14.33	14.19	13.49	13.49	13.35	13.77	14.19	14.47	14.75	1	(38
leat transfer o	oefficier	nt. W/K						(39)m	= (37) + (37)	38)m	•		
			60.53	60.38	59.68	59.68	59.54	59.96	60.38	60.67	60.95	1	
39)m= 61.51	61.37	61.23	00.55										

leat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
1.11 lo)m=	1.11	1.11	1.09	1.09	1.08	1.08	1.08	1.08	1.09	1.1	1.1		
lumber of day	e in moi	nth (Tah	le 1a)		•	•	•	,	Average =	Sum(40) ₁ .	12 /12=	1.09	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing enei	rgy 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.		85		(42)
nnual averag leduce the annua ot more that 125	l average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.05		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			•			
4)m= 85.85	82.73	79.61	76.49	73.36	70.24	70.24	73.36	76.49	79.61	82.73	85.85		— ,
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		936.55	(44
15)m= 127.31	111.35	114.9	100.17	96.12	82.94	76.86	88.2	89.25	104.01	113.54	123.3		
									Total = Su	m(45) ₁₁₂ =	=	1227.97	(45
instantaneous w									1	ı			(4 6
Vater storage	16.7 loss:	17.24	15.03	14.42	12.44	11.53	13.23	13.39	15.6	17.03	18.49		(46
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47
community h	•			•			` '						
Otherwise if no Vater storage		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/day):				2.	24		(48
emperature fa					,	• ,					.6		(49
nergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1.	34		(50
o) If manufact			-										-
lot water stora community h	•			e z (KVV	n/iitre/da	ıy)					0		(5
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)								1.	34		(5
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
66)m= 41.66 cylinder contains	37.63 dedicate	41.66 d solar sto	40.32 rage, (57)	41.66 m = (56)m	40.32 x [(50) – (41.66 H11)] ÷ (5	41.66 0), else (5	40.32 7)m = (56)	41.66 m where (40.32 H11) is fro	41.66 m Appendix	¢Η	(56
57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57
<i>'</i>		l .									0		(58
rimary circuit	loss cal	culated f	or each	month (•	. ,	, ,				<u> </u>		(30
(modified by					ı —	ı —		-		r í			
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	alculated	for each	month ((61)m =	(60) ÷ 3	65 × (41)m						
(61)m= 0	0	0	0	0	0	O	0	0	0	0	0	1	(61)
Total heat red	uired for	water he	eating ca	alculated	l for ead	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 192.24	·	179.83	163.01	161.05	145.78	141.79	153.12		168.94	176.37	188.22]	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	H (nega	ive quantity	y) (enter	0' if no sola	r contribu	tion to wate	er heating)	J	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applies	s, see Ap	pendix	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	vater hea	ter						•	•		•	•	
(64)m= 192.24	169.99	179.83	163.01	161.05	145.78	141.79	153.12	152.08	168.94	176.37	188.22		
						•	Ou	tput from w	ater heate	er (annual)	112	1992.42	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 94.27	83.94	90.15	83.57	83.9	77.84	77.5	81.27	79.94	86.53	88.02	92.94		(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwellin	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso see	Table 5				•	
(67)m= 14.35	12.75	10.37	7.85	5.87	4.95	5.35	6.96	9.34	11.85	13.83	14.75		(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), als	o see Ta	ble 5			•	
(68)m= 160.96	162.63	158.42	149.46	138.15	127.52	120.42	118.75	122.95	131.92	143.23	153.86		(68)
Cooking gains	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	see Table	5		•	•	
(69)m= 32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23		(69)
Pumps and fa	ns gains	(Table 5	āa)									•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)			-			-	•	
(71)m= -73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85		(71)
Water heating	g gains (T	able 5)				-		•				•	
(72)m= 126.71	124.91	121.16	116.07	112.77	108.12	104.16	109.23	111.03	116.3	122.25	124.92		(72)
Total interna	l gains =				(66	5)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	•	
(73)m= 352.71	350.97	340.64	324.07	307.48	291.28	280.62	285.62	294.01	310.76	330	344.21]	(73)
6. Solar gain	is:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to th	ne applica		tion.		
Orientation:			Area		Flo	ux ible 6a		g_ Table 6b	т	FF		Gains	
	Table 6d		m²				, _	Table 6b	_ '	able 6c		(W)	_
Southwest _{0.9x}		X	1.6	35	X	36.79	ļ <u>L</u>	0.44	x	0.8	=	29.62	(79)
Southwest _{0.9x}	0.77	X	2.1	2	Х	36.79	ļ L	0.44	x	0.8	=	19.03	(79)
Southwest _{0.9x}	0.77	X	1.6	S5	х	62.67	ļ <u>L</u>	0.44	x	0.8	=	50.45	(79)
Southwest _{0.9x}		х	2.1	2	x	62.67	ļ <u>Ļ</u>	0.44	x	0.8	=	32.41	(79)
Southwest _{0.9x}	0.77	X	1.6	S5	X	85.75		0.44	Х	0.8	=	69.03	(79)

								1			_				
Southwest _{0.9x}	0.77	X	2.1	2	X	8	35.75	_		0.44	X	0.8	=	44.35	(79)
Southwest _{0.9x}	0.77	Х	1.6	55	X	1	06.25	<u> </u>		0.44	X	0.8	=	85.53	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	06.25			0.44	X	0.8	=	54.95	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	19.01			0.44	X	0.8	=	95.8	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	19.01			0.44	X	0.8	=	61.55	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	18.15			0.44	X	0.8	=	95.11	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	18.15			0.44	X	0.8	=	61.1	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	13.91			0.44	X	0.8	=	91.7	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	13.91			0.44	X	0.8	=	58.91	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	04.39]		0.44	X	0.8	=	84.03	(79)
Southwest _{0.9x}	0.77	х	2.1	2	X	1	04.39]		0.44	x	0.8	=	53.98	(79)
Southwest _{0.9x}	0.77	х	1.6	55	X	9	2.85			0.44	x	0.8	=	74.74	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	9	2.85			0.44	x	0.8	=	48.02	(79)
Southwest _{0.9x}	0.77	x	1.6	55	X	6	9.27	Ī		0.44	x	0.8	_ =	55.76	(79)
Southwest _{0.9x}	0.77	x	2.1	2	X	6	9.27	ĺ		0.44	x	0.8	_ =	35.82	(79)
Southwest _{0.9x}	0.77	x	1.6	55	X	4	4.07	ĺ		0.44	×	0.8	=	35.48	(79)
Southwest _{0.9x}	0.77	х	2.1	2	X	4	4.07	ĺ		0.44	x	0.8	=	22.79	(79)
Southwest _{0.9x}	0.77	x	1.6	i5	X	3	31.49	ĺ		0.44	x	0.8	=	25.35	(79)
Southwest _{0.9x}	0.77	x	2.1	2	X	3	31.49	ĺ		0.44	×	0.8		16.28	(79)
Northwest _{0.9x}	0.77	x	3.6	64	X	1	1.28	х		0.44	x	0.8	=	20.04	(81)
Northwest 0.9x	0.77	x	3.6	64	X	2	2.97	х		0.44	x	0.8	=	40.79	(81)
Northwest _{0.9x}	0.77	x	3.6	64	X	4	1.38	x		0.44	×	0.8		73.48	(81)
Northwest _{0.9x}	0.77	X	3.6	64	X	6	7.96	x		0.44	x	0.8		120.68	(81)
Northwest 0.9x	0.77	x	3.6	64	X	9	1.35	х		0.44	x	0.8	=	162.22	(81)
Northwest _{0.9x}	0.77	x	3.6	64	X	9	7.38	x		0.44	×	0.8		172.94	(81)
Northwest 0.9x	0.77	x	3.6	64	X	,	91.1	х		0.44	x	0.8	=	161.78	(81)
Northwest 0.9x	0.77	x	3.6	64	X	7	2.63	x		0.44	x	0.8	=	128.97	(81)
Northwest 0.9x	0.77	x	3.6	64	X	5	0.42	x		0.44	×	0.8	=	89.54	(81)
Northwest _{0.9x}	0.77	x	3.6	64	X	2	8.07	x		0.44	x	0.8		49.84	(81)
Northwest 0.9x	0.77	x	3.6	64	X		14.2	х		0.44	x	0.8	=	25.21	(81)
Northwest 0.9x	0.77	x	3.6	64	X	,	9.21	x		0.44	x	0.8		16.36	(81)
_											_				
Solar gains in v	watts, ca	alculated	for eac	n mont	h			(83)m	n = Si	um(74)m .	(82)m		_	_	
(83)m= 68.68	123.65	186.86	261.16	319.57		29.15	312.39	266	5.99	212.3	141.42	83.48	57.99		(83)
Total gains – ir	nternal a	nd solai	· (84)m =	<u> </u>		83)m	, watts					_		_	
(84)m= 421.39	474.62	527.5	585.23	627.04	6	20.43	593.01	552	2.62	506.31	452.18	413.48	402.21		(84)
7. Mean interr	nal temp	erature	(heating	seaso	n)										
Temperature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisation fact	tor for g	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)							_	
Jan	Feb	Mar	Apr	May	_	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	_	
(86)m= 0.94	0.92	0.88	0.8	0.69		0.54	0.41	0.4	46	0.65	0.84	0.92	0.95	_	(86)
Mean_internal	tempera	ature in	living are	ea_T1 (follo	w ste	ps 3 to 7	7 in T	[able	e 9c)				_	
(87)m= 18.94	19.2	19.61	20.14	20.57	2	20.84	20.94	20.	.93	20.73	20.18	19.48	18.89		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	
(88)m= 19.99 19.99 19.99 20.01 20.01 20.02 20.02 20.02 20.01 20.01 20 20	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 0.93 0.91 0.87 0.78 0.64 0.47 0.33 0.37 0.59 0.81 0.91 0.94	1 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	_
(90)m= 17.25 17.62 18.22 18.96 19.53 19.88 19.98 19.97 19.75 19.03 18.04 17.1	9 (90)
$fLA = Living area \div (4) =$	0.52 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.13 18.44 18.94 19.57 20.07 20.38 20.48 20.47 20.25 19.62 18.78 18.0	7 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	_
(93)m= 18.13 18.44 18.94 19.57 20.07 20.38 20.48 20.47 20.25 19.62 18.78 18.0	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-center the utilisation factor for gains using Table 9a	alculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	ec
Utilisation factor for gains, hm:	_
(94)m= 0.92 0.89 0.84 0.76 0.65 0.5 0.37 0.41 0.61 0.79 0.89 0.92	2 (94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 385.97 422.24 445.48 447.12 405.7 309.86 220.3 226.99 307.49 358.73 366.59 371.4	41 (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= 850.51 830.83 761.82 645.86 505.57 344.91 231.63 242.1 369.03 544.8 708.77 845.4	41 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 345.61 274.57 235.35 143.09 74.31 0 0 0 138.43 246.37 352.0	35
Total per year (kWh/year) = Sum(98) _{15,91}	2 = 1810.39 (98)
Space heating requirement in kWh/m²/year	32.74 (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.	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 Annual space heating requirement	kWh/year 1810.39
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1900.91 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308

Space heating requirement from secondary	ary/supplementary system	(98) x (301) x 1	00 ÷ (308) =		0	(309)
	ary/supplementary system	(66) X (66.1) X 1	. (000)](000)
Water heating Annual water heating requirement					1992.42	1
If DHW from community scheme:				_		
Water heat from Community boilers		(64) x (303a) x	$(305) \times (306) =$	L	2092.04	(310a)
Electricity used for heat distribution	0	01 × [(307a)(307	e) + (310a)(310e)]	= _	39.93	(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, extract	<u> </u>	de			107.27	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b	o) + (330g) =		107.27	(331)
Energy for lighting (calculated in Append	lix L)				253.42	(332)
12b. CO2 Emissions – Community heating	ng scheme					-
		nergy Wh/year	Emission factor kg CO2/kWh			
				v r	1 (17///aar	
CO2 from other courses of chace and we		· · · · · · · · · · · · · · · · · · ·	kg COZ/KWII	ΚÇ	j CO2/year	
CO2 from other sources of space and wa Efficiency of heat source 1 (%)		•	•		89.5	(367a)
·	ater heating (not CHP) If there is CHP using two fu	•	•](367a)](367)
Efficiency of heat source 1 (%)	ater heating (not CHP) If there is CHP using two fu	nels repeat (363) to x 100 ÷ (367b) x	(366) for the second	fuel	89.5]
Efficiency of heat source 1 (%) CO2 associated with heat source 1	ater heating (not CHP) If there is CHP using two fu [(307b)+(310b)]	nels repeat (363) to x 100 ÷ (367b) x	(366) for the second 0.22 0.52	fuel =	89.5 963.66	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	enter heating (not CHP) If there is CHP using two fu [(307b)+(310b)] [(313) > vstems (363)	rels repeat (363) to x 100 ÷ (367b) x (366) + (368)(372	(366) for the second 0.22 0.52	fuel = =	89.5 963.66 20.72	(367) (372)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy	enter heating (not CHP) If there is CHP using two fu [(307b)+(310b)] [(313) > /stems (363) ondary) (309) x	rels repeat (363) to x 100 ÷ (367b) x (366) + (368)(372	(366) for the second 0.22 0.52	fuel = = = =	89.5 963.66 20.72 984.39	(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	enter heating (not CHP) If there is CHP using two fur [(307b)+(310b)] [(313) > vstems (363) ondary) (309) x ion heater or instantaneous h	rels repeat (363) to x 100 ÷ (367b) x (366) + (368)(372	(366) for the second 0.22 0.52 0 0	fuel = = = = =	89.5 963.66 20.72 984.39](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)	reter heating (not CHP) If there is CHP using two fur [(307b)+(310b)] [(313) > reterms (363) (309) x fon heater or instantaneous heater heating (373) +	els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372 eater (312) x (374) + (375) =	(366) for the second 0.22 0.52 0 0	fuel = = = = =	89.5 963.66 20.72 984.39 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 total CO2 associated with space and co2 associated with space and co2 associated with space and	ater heating (not CHP) If there is CHP using two fur [(307b)+(310b)] [(313) > // // // // // // // // //	els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) =	(366) for the second 0.22 0.52 0 0 0.52	fuel = = = = = =	89.5 963.66 20.72 984.39 0 0 984.39](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 (secondary community) CO2 associated with water from immersion cost associated with space and was community sy CO2 associated with electricity for pumps CO2 associated with electricity for lighting	ater heating (not CHP) If there is CHP using two fur [(307b)+(310b)] [(313) > // // // // // // // // //	els repeat (363) to x 100 ÷ (367b) x (366) + (368)(372) eater (312) x (374) + (375) =	(366) for the second 0.22 0.52 0 0 0.52	fuel = = = = = = =	89.5 963.66 20.72 984.39 0 0 984.39 55.67](367)](372)](373)](374)](375)](376)](378)

El rating (section 14)

(385)

84.35

		l Jeer I	Details:						
Assessor Name:	Vitaliy Troyan	<u></u>	Strom	a Num	ber		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
		Property	Address	: 5_01 -	1B2P				
Address:	aniana.								
1. Overall dwelling dimer	isions:	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	146.55	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)			_		
Dwelling volume				l (3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	146.55	(5)
2. Ventilation rate:									
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+ [0	 =	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	= +	0		0	x	20 =	0	(6b)
Number of intermittent fan	s				2	x ·	10 =	20	(7a)
Number of passive vents				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fire	es			Ė	0	X 4	40 =	0	(7c)
				_					_
				_			Air ch	nanges per ho	our —
•	s, flues and fans = $(6a)+(6b)+$ en carried out or is intended, proce			continue f	20		÷ (5) =	0.14	(8)
Number of storeys in the		5u to (11),	ourier wise t	Jonanae n	OIII (9) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding gs); if equal user 0.35	to the grea	ter wall are	a (atter					
·	oor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ente	·							0	(13)
Window infiltration	and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
•	y value, then $(18) = [(17) \div 20] +$							0.39	(18)
	if a pressurisation test has been do	ne or a de	egree air pe	rmeability	is being u	sed		_	7(10)
Number of sides sheltered Shelter factor	1		(20) = 1 -	[0.075 x (′	19)] =			3 0.78	(19) (20)
Infiltration rate incorporation	ng shelter factor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified fo	r monthly wind speed								
Jan Feb M	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 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								
(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	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35]	
alculate effec		-	rate for t	he appli	cable ca	se	!				!	<u>, </u>	
If mechanical If exhaust air he			andiv N (2	3h) - (23a	a) v Emy (e	aguation (N	VSV) other	wice (23h) <i>- (</i> 23a)			0	
If balanced with) = (23a)			0	
		•	-	_					7h.\ //	00h) [/	1 (00.0)	0	
a) If balance	o mecha	o o	0	o with he	0		1K) (248	0	0	230) x [0) - 100]]	
b) If balance												J	
4b)m= 0	o mech	o 0	0	without 0	0	0	0	0	0	0	0	1	
c) If whole h									U			J	
if (22b)n				•	•				5 x (23b))			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	n from l	oft				J	
if (22b)n				•	•				0.5]				
4d)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 (24b	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	0.54	0.55	0.56	0.56]	
. Heat losse	e and he	at lose r	naramete	or:								_	
. Heat losse LEMENT	Gros	·	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-value	۵	ΑXk
LEIVIENI	area	_	m		A,r		W/m2		(W/I	〈)	kJ/m ² ·		kJ/K
indows Type	: 1				1.65	x1.	/[1/(1.4)+	0.04] =	2.19				
indows Type	2				2.12	x1,	/[1/(1.4)+	0.04] =	2.81	=			
indows Type	3				3.64	x1.	/[1/(1.4)+	0.04] =	4.83	=			
alls Type1	43.	5	12.7		30.8	x	0.18	─ <u>-</u>	5.54	=		— г	
alls Type2	12.2		0	=	12.2	=	0.18	=	2.2	=		- -	
oof	55.3		0	=		x				룩 ;		ᆿ 누	
otal area of e					55.3	= ^	0.13	[7.19				
or windows and			offective wi	ndow I I-ve	111	ated using	ı formula 1	/[/1/ ₋ valu	ne)+0 041 a	e aiven in	naragrani	h 3 2	
include the area						atou using	TOTTIUIA 1	I (170 vala	C)+0.0+j a	is giveri iii	paragrapi	7 5.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.7	77
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	497	7.7
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	0
r design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste						_							
nermal bridge	•	,			-	<						5.5	5
letails of therma Ital fabric he		are not kn	own (36) =	= <i>0.05 x (</i> 3	11)			(33) +	(36) =			07.0	32
entilation hea		alculator	l monthly	,					$= 0.33 \times ($	25\m v (5)		37.3	52
Jan	Feb	Mar			Jun	Jul	Διια	Sep	Oct	Nov		1	
3)m= 27.71	27.57	27.44	Apr 26.8	May 26.69	26.14	26.14	Aug 26.04	26.35	26.69	26.93	27.17	1	
		<u> </u>	20.0	20.00	20.14	20.14	20.04			<u> </u>	21.11	J	
eat transfer o		r			l				= (37) + (3			1	
9)m= 65.02	64.89	64.75	64.12	64	63.45	63.45	63.35	63.67	64	64.24	64.49	1	

Heat loss parar	meter (H	-II P) \///	m²K					(40)m	= (39)m ÷	. (4)			
(40)m= 1.18	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.17		
(10)=		11.17	1.10		1110	1.10			<u> </u>	Sum(40) ₁ .		1.16	(40)
Number of days	s in mo	nth (Tabl	le 1a)						.vo.ago	Sum (10)1		0	(-/
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	ng ene	rgy requi	rement:								kWh/ye	ear:	
												ı	
Assumed occup 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 (ΓFA -13.		85		(42)
Annual average Reduce the annual									se target o		.05		(43)
not more that 125 l	_				-	•	o acriieve	a water us	se larget o	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				<u></u>				СОР		1101			
(44)m= 85.85	82.73	79.61	76.49	73.36	70.24	70.24	73.36	76.49	79.61	82.73	85.85		
(**)										m(44) ₁₁₂ =	l	936.55	(44)
Energy content of I	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)Tm / 3600			` '			`
(45)m= 127.31	111.35	114.9	100.17	96.12	82.94	76.86	88.2	89.25	104.01	113.54	123.3		
								-	Total = Su	m(45) ₁₁₂ =	=	1227.97	(45)
If instantaneous wa	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m= 19.1	16.7	17.24	15.03	14.42	12.44	11.53	13.23	13.39	15.6	17.03	18.49		(46)
Water storage		مالد داد مال		-l \A	/\/! IDC	_4			1				
Storage volume	, ,					_		ame ves	sei		150		(47)
If community he Otherwise if no	•			•			` '	are) ante	or 'O' in <i>(</i>	47)			
Water storage I		not wate	:i (uii3 ii	iciuu c s i	iistaiitai	ieous co	ווטט וטוווי	ers) erite	ווו ט ווו (47)			
a) If manufactu		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	65		(48)
Temperature fa	ctor fro	m Table	2b							0.	54		(49)
Energy lost fror				ear			(48) x (49)) =			89		(50)
b) If manufactu		_	-		or is not	known:							,
Hot water stora	-			e 2 (kW	h/litre/da	ıy)					0		(51)
If community he	_		on 4.3										(==)
Volume factor factor factor factor factor			2h							—	0		(52) (53)
·							(47) ~ (54)) v (F2) v (l	E0)		0		, ,
Energy lost from Enter (50) or (5		_	, KVVII/y€	al			(47) X (31)) x (52) x (55) =	-	0 89		(54) (55)
Water storage I	, ,	,	or each	month			((56)m = (55) × (41)ı	m	0.	09		(00)
					00.77		., , ,	, , ,	ı	00.77	07.00		(EC)
(56)m= 27.66 If cylinder contains	24.99 dedicate	27.66 d solar sto	26.77 rage, (57)ı	27.66 m = (56)m	26.77 x [(50) – (27.66 H11)] ÷ (5	27.66 0), else (5	26.77 7)m = (56)	27.66 m where (26.77 H11) is fro	27.66 m Append	ix H	(56)
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
` ′		<u> </u>											(58)
Primary circuit	,	•			50)m - 1	'58\ · 26	S5 ~ (41)	m			0		(30)
(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 loss ca	lculated	for each	month (′61)m =	(60) ÷ 3	65 × (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(61)
	uired for	water he	eating ca	alculated	l for ead	h month	(62)m	= 0.85 ×	 (45)m +	(46)m +	(57)m +	- (59)m + (61)m	
(62)m= 178.24	157.35	165.83	149.46	147.05	132.23	127.79	139.1		154.94	162.82	174.22	1	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	H (nega	ive quantity	y) (entei	'0' if no sola	r contribu	tion to wate	er heating))	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applies	s, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter											
(64)m= 178.24	157.35	165.83	149.46	147.05	132.23	127.79	139.1	2 138.53	154.94	162.82	174.22]	_
							0	utput from w	ater heate	er (annual)	112	1827.58	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	<u>ı</u>]	
(65)m= 83.07	73.82	78.95	72.73	72.7	67.01	66.3	70.07	69.1	75.33	77.18	81.74]	(65)
include (57)	m in cald	culation o	of (65)m	only if c	ylinder	is in the	dwellir	g or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):									
Metabolic gair	ns (Table	5), Wat	ts								_	_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec]	
(66)m= 92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31]	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	ilso se	e Table 5					
(67)m= 14.35	12.75	10.37	7.85	5.87	4.95	5.35	6.96	9.34	11.85	13.83	14.75]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5			_	
(68)m= 160.96	162.63	158.42	149.46	138.15	127.52	120.42	118.7	5 122.95	131.92	143.23	153.86]	(68)
Cooking gains	(calcula	ted in A	opendix	L, equat	ion L15	or L15a), also	see Table	5	-	-		
(69)m= 32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23]	(69)
Pumps and fa	ns gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. ev	/aporatio	n (nega	ive valu	es) (Tab	le 5)								
(71)m= -73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.8	5 -73.85	-73.85	-73.85	-73.85]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 111.66	109.85	106.11	101.02	97.72	93.06	89.11	94.18	95.98	101.24	107.19	109.86]	(72)
Total internal	gains =				(66	6)m + (67)m	า + (68)เ	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 340.66	338.92	328.59	312.02	295.42	279.23	268.57	273.5	7 281.96	298.7	317.95	332.16]	(73)
6. Solar gain	s:												
Solar gains are		•				·	ations to	convert to th	ne applica		tion.	_	
Orientation:	Access F Table 6d	actor	Area m²		Flo	ux ible 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
_												. ,	٦
Southwest _{0.9x}	0.77	X	1.6	==		36.79	┆╶┟	0.63		0.7	=	37.11	<u> </u> (79)
Southwesto s	0.77	X	2.1			36.79	<u> </u>	0.63		0.7	=	23.84	<u></u> (79)
Southwesto.9x	0.77	X	1.6			62.67	ļ <u>Ļ</u>	0.63	×	0.7	=	63.21	」 (79)
Southwest _{0.9x}	0.77	X	2.1		<u> </u>	62.67	ļĻ	0.63		0.7	=	40.61	」 (79)
Southwest _{0.9x}	0.77	X	1.6	35	X	85.75	J L	0.63	Х	0.7	=	86.48	(79)

Southwest _{0.9x}	0.77	x	0.44		X		.r. 7r	1		0.00	×	0.7		55.50	(79)
Southwest _{0.9x}	0.77	_	2.12				5.75]]		0.63	╡	0.7	=	55.56	
Southwest _{0.9x}	0.77	×	1.6		X		06.25]]		0.63	」 ×	0.7	╡ :	107.16	(79)
Southwest _{0.9x}	0.77	×	2.12		X		06.25]]		0.63	」 × ¬ 、	0.7	┥:	68.84	
Southwest _{0.9x}	0.77	x	1.6		X		19.01]]		0.63	x	0.7	_ =	120.02	== `
Southwest _{0.9x}	0.77	x	2.12		Χ		19.01] 1		0.63	X	0.7	_ =	77.11	(79)
<u> </u>	0.77	X	1.6		X		18.15] 1		0.63	×	0.7	_ =	119.16	=
Southwesto.9x	0.77	X	2.12		X		18.15] 1		0.63	×	0.7	_ =	76.55	(79)
Southwesto.ex	0.77	X	1.6		X		13.91] i		0.63	×	0.7	_ =	114.88	=======================================
Southwest _{0.9x}	0.77	X	2.12		X		13.91] 1		0.63	X	0.7	=	73.8	(79)
Southwesto.9x	0.77	X	1.6		X		04.39	 		0.63	×	0.7	=	105.28	
Southwest _{0.9x}	0.77	X	2.12		X		04.39	 		0.63	×	0.7	_ =	67.63	(79)
Southwest _{0.9x}	0.77	×	1.6	5	X	5	2.85	 		0.63	×	0.7	=	93.64	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	9	2.85			0.63	×	0.7	=	60.16	(79)
Southwest _{0.9x}	0.77	X	1.6	5	X	6	9.27			0.63	X	0.7	=	69.86	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	6	9.27	<u> </u>		0.63	X	0.7	=	44.88	(79)
Southwest _{0.9x}	0.77	X	1.6	5	X	4	4.07			0.63	X	0.7	=	44.45	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	4	4.07	[0.63	X	0.7	=	28.55	(79)
Southwest _{0.9x}	0.77	X	1.6	5	X	3	1.49			0.63	X	0.7	=	31.76	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	3	1.49			0.63	X	0.7	=	20.4	(79)
Northwest _{0.9x}	0.77	X	3.6	4	X	1	1.28	X		0.63	X	0.7	=	25.1	(81)
Northwest _{0.9x}	0.77	X	3.6	4	X	2	2.97	X		0.63	X	0.7	=	51.1	(81)
Northwest _{0.9x}	0.77	X	3.6	4	X	4	1.38	X		0.63	X	0.7	=	92.06	(81)
Northwest _{0.9x}	0.77	Х	3.64	4	X	6	7.96	X		0.63	X	0.7	=	151.19	(81)
Northwest _{0.9x}	0.77	X	3.6	4	X	9	1.35	X		0.63	X	0.7	=	203.23	(81)
Northwest _{0.9x}	0.77	X	3.64	4	x	9	7.38	x		0.63	x	0.7	=	216.67	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	,	91.1	x		0.63	X	0.7	=	202.69	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	7	2.63	x		0.63	X	0.7	=	161.58	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	5	0.42	x		0.63	x	0.7	=	112.18	(81)
Northwest _{0.9x}	0.77	X	3.64	4	x	2	8.07	X		0.63	x	0.7	=	62.45	(81)
Northwest 0.9x	0.77	х	3.64	4	x		14.2	X		0.63	x	0.7	=	31.59	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	,	9.21	x		0.63	x	0.7	=	20.5	(81)
								-							
Solar gains in v	vatts, ca	lculated	for each	mont	h_			(83)m	n = Su	ım(74)m	(82)m			_	
(83)m= 86.05	154.91	234.1	327.19	400.36		12.37	391.37	334	4.5	265.98	177.18	104.59	72.66		(83)
Total gains – in	ternal a	nd solar	(84)m =	(73)m	+ (83)m	, watts						1	7	
(84)m= 426.71	493.83	562.69	639.21	695.79) 6	91.6	659.94	608	.07	547.94	475.89	422.53	404.82	_	(84)
7. Mean intern	nal temp	erature	(heating	seaso	n)										
Temperature of	during h	eating p	eriods in	the liv	/ing	area	from Tal	ole 9	, Th1	I (°C)				21	(85)
Utilisation fact	or for ga	ains for I	iving are	a, h1,ı	n (s	ee Ta	ble 9a)							_	
Jan	Feb	Mar	Apr	May	<u>/ </u>	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	_	
(86)m= 0.99	0.99	0.97	0.9	0.76		0.57	0.42	0.4	47	0.73	0.94	0.99	1	_	(86)
Mean_internal	tempera	ature in	living are	a T1 (follo	w ste	ps 3 to 7	in T	able	9c)				_	
(87)m= 19.88	20.06	20.33	20.66	20.89	2	20.98	21	20.	99	20.93	20.63	20.19	19.85		(87)
														_	

T			and a dia dia			(T.	LL O T	LO (0 0)					
Temperatu		, , ,				1	1	``	10.05	40.05	10.05		(00)
(88)m= 19.9 ²	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.96	19.95	19.95	19.95		(88)
Utilisation f		1			```		9a)						
(89)m= 0.99	0.98	0.96	0.87	0.7	0.48	0.32	0.37	0.65	0.91	0.98	0.99		(89)
Mean interr	nal tempe	rature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)		_		
(90)m= 18.47	7 18.73	19.12	19.58	19.86	19.95	19.96	19.96	19.91	19.55	18.93	18.43		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.52	(91)
Mean interr	nal tempe	rature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			·		
(92)m= 19.2		19.75	20.14	20.39	20.48	20.5	20.5	20.44	20.11	19.59	19.16		(92)
Apply adjus	tment to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.2	19.42	19.75	20.14	20.39	20.48	20.5	20.5	20.44	20.11	19.59	19.16		(93)
8. Space he	eating req	uirement											
Set Ti to the the utilisation			•		ned at sto	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jar	1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation f	actor for g	jains, hm	<u>. </u>										
(94)m= 0.99	0.98	0.95	0.88	0.73	0.53	0.37	0.42	0.69	0.92	0.98	0.99		(94)
Useful gain	s, hmGm	, W = (94	4)m x (84	4)m									
(95)m= 422.5	1 483.98	536.61	561.81	507.01	365.48	246.26	257.51	376.5	436.55	414.16	401.67		(95)
Monthly av	erage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra		1				- ` 	x [(93)m	– (96)m]				
(97)m= 968.9		857.86	720.79	556.34	373.39	247.37	259.56	403.77	608.54	802.17	965.04		(97)
Space heat		1			i					·			
(98)m= 406.5	8 307.75	239.02	114.46	36.7	0	0	0	0	127.96	279.36	419.15		_
							Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1930.98	(98)
Space heat	ing requir	ement in	kWh/m²	/year								34.92	(99)
9a. Energy r	equireme	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space hea	•			/I-							i	_	¬,,,,,
Fraction of	•				mentary	-		,				0	(201)
Fraction of	space hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of	total heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of	f main sp	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	f seconda	ary/supple	ementar	y heating	g systen	ո, %						0	(208)
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space heat	ing requir	ement (c	alculate	d above))							•	
406.5	8 307.75	239.02	114.46	36.7	0	0	0	0	127.96	279.36	419.15		
(211)m = {[(9	98)m x (20	04)] } x 1	00 ÷ (20)6)									(211)
434.8	4 329.15	255.63	122.42	39.26	0	0	0	0	136.85	298.78	448.29		
	•	•			•	•	Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	<u></u>	2065.22	(211)
Space heat	ing fuel (s	econdar	y), kWh/	month									_
= {[(98)m x (•		• , .										
(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)

Vater heating Output from water heater (calculated above)								
·	32.23 127.79	139.12	138.53	154.94	162.82	174.22		
Efficiency of water heater	•						79.8	(21
217)m= 86.95 86.57 85.79 84.11 81.73	79.8 79.8	79.8	79.8	84.31	86.24	87.07		(21
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m								
, <u> </u>	165.7 160.13	174.34	173.6	183.78	188.8	200.09		
	•	Tota	I = Sum(2	19a) ₁₁₂ =		•	2184.1	(21
Annual totals				k\	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							2065.22	
Vater heating fuel used							2184.1	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(23
boiler with a fan-assisted flue						45		(23
otal electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(23
Electricity for lighting							253.42	(23
12a. CO2 emissions – Individual heating system	s including m	icro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	446.09	(26
Space heating (secondary)	(215) x			0.5	19	=	0	(26
Vater heating	(219) x			0.2	16	=	471.76	(26
Space and water heating	(261) + (262)	+ (263) + (264) =				917.85	(26
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(26
electricity for lighting	(232) x			0.5	19	=	131.52	(26

TER =

(273)

19.68

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:08

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64.7m²

5_02 - 2B3P Site Reference : **Tottenham Mews Plot Reference:**

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

20.35 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 21.70 kg/m² Fail

Excess emissions = 1.35 kg/m² (6.6 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 56.9 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70) **OK** Floor (no floor) Roof 0.14 (max. 0.20) 0.14 (max. 0.35) OK **Openings** OK 1.10 (max. 2.00) 1.10 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Charging system linked to use of community heating, programmer and TRVsOK Space heating controls

Hot water controls: Cylinderstat **OK**

OK

Regulations Compliance Report

7 Low energy lights		
	400.00/	
Percentage of fixed lights with low-energy fittings	100.0%	-11
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	OK
MVHR efficiency:	78%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	6.82m²	
Windows facing: North East	9.51m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or rolle	er blind
Billido/oditallio.	Closed 100% of daylight hou	
	Closed 100% of daylight flot	113
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from boilers – mains gas		
Community heating, heat from boilers – mains gas		

		l lser I	Details:										
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096					
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.5.12					
	F	Property	Address	5_02 -	2B3P								
Address:	Address: 1. Overall dwelling dimensions:												
1. Overall dwelling diffle	11310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	')				
Ground floor				(1a) x		.65	(2a) =	171.45	(3a)				
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	64.7	(4)			_						
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	171.45	(5)				
2. Ventilation rate:													
	main seconda heating heating	ry	other		total			m³ per hou	r				
Number of chimneys		7 + [0] = [0	X 4	40 =	0	(6a)				
Number of open flues	0 + 0	╗┾╒	0	Ī - Ē	0	x 2	20 =	0	(6b)				
Number of intermittent fa	ns				0	x -	10 =	0	(7a)				
Number of passive vents				Ē	0	x '	10 =	0	(7b)				
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)				
				L									
				_			Air ch	nanges per ho	our —				
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced			continuo fr	0		÷ (5) =	0	(8)				
Number of storeys in the		o 10 (11),	ourier wise t	onunae n	om (5) to	(10)		0	(9)				
Additional infiltration						[(9)	-1]x0.1 =	0	(10)				
	.25 for steel or timber frame o			•	ruction			0	(11)				
if both types of wall are prideducting areas of opening	resent, use the value corresponding t ngs); if equal user 0.35	o the grea	ter wall are	a (atter									
•	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)				
If no draught lobby, ent	•							0	(13)				
<u> </u>	s and doors draught stripped		0.05 [0.0	v (1.4) · .4	1001			0	(14)				
Window infiltration			0.25 - [0.2] (8) + (10)	. ,	-	⊥ (15) –		0	(15)				
Infiltration rate	q50, expressed in cubic metr	se par h					area	0	(16)				
•	ity value, then (18) = [(17) ÷ 20]+		•	•	elle oi e	rivelope	aica	0.15	(17)				
•	s if a pressurisation test has been do				is being u	sed		0.10	()				
Number of sides sheltere	d							3	(19)				
Shelter factor			(20) = 1 -	[0.075 x (1	19)] =			0.78	(20)				
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.12	(21)				
Infiltration rate modified for		1	1 .		T _	T	I _	1					
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp		T	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 = $(22a)$ m =	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						

djusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
<i>alculate effed</i> If mechanica		_	rate for t	he appli	cable ca	se	•			•	•	0.5	(2
If exhaust air h	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				66.3	(2
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (I	MV) (24b	o)m = (22	2b)m + (23b)			
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h			ntilation on then (24)		•				5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n			ole hous m = (22b		•				0.5]			•	
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		-	-	-	
5)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31		(2
B. Heat losse	s and he	eat loss i	paramet	ër.									
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-		A X k kJ/K
indows Type) 1				6.82	x1	/[1/(1.1)+	0.04] =	7.19				(2
indows Type	2				3.17	x1	/[1/(1.1)+	0.04] =	3.34				(2
alls Type1	57.	5	16.33	3	41.17	x	0.2	=	8.23				(2
alls Type2	14.8	8	0		14.8	X	0.19	= [2.74				(2
oof	64.7	7	0		64.7	X	0.14	= [9.06				(;
otal area of e	lements	, m²			137								(;
or windows and include the area						ated using	g formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragraph	1 3.2	
abric heat los	ss, W/K =	= S (A x	U)				(26)(30)) + (32) =				37.24	(;
eat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	582.3	(:
nermal mass	parame	ter (TMF	o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
er design assess n be used inste				construct	ion are no	known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
nermal bridge				usina An	nendix k	<						20.55	(;
letails of therma	`	,		• .	•	•						20.55	(
otal fabric he	at loss							(33) +	(36) =			57.79	(;
entilation hea	at loss ca	alculated	l monthly	<u>/</u>				(38)m	= 0.33 × ((25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 17.92	17.76	17.59	16.77	16.6	15.78	15.78	15.62	16.11	16.6	16.93	17.26		(3
	nofficial	nt W/K						(39)m	= (37) + (37)	 38)m			
eat transfer o	,oemolei	,,						()	(- / (
eat transfer (9)m= 75.71	75.54	75.38	74.56	74.39	73.57	73.57	73.41	73.9	74.39	74.72	75.05		

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 1.17	1.17	1.17	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16		
	!	!	Į.	ļ .	Į.	!	<u> </u>		Average =	Sum(40) ₁	12 /12=	1.15	(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 requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		11		(42)
Annual averag	je hot wa al average	hot water	usage by	5% if the a	lwelling is	designed i			se target o		.33		(43)
not more that 125	litres per	person pei	day (all w	/ater use, l	not and co	ld) •			,				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 92.77	89.39	86.02	82.65	79.27	75.9	75.9	79.27	82.65	86.02	89.39	92.77		_
Energy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,ı	n x nm x D	OTm / 3600			ım(44) ₁₁₂ = ables 1b, 1		1012.02	(44)
(45)m= 137.57	120.32	124.16	108.25	103.87	89.63	83.05	95.31	96.44	112.4	122.69	133.23		
, ,	l			l		l			Total = Su	I ım(45) ₁₁₂ =	=	1326.91	(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)			'		
(46)m= 20.64	18.05	18.62	16.24	15.58	13.44	12.46	14.3	14.47	16.86	18.4	19.98		(46)
Water storage			-										
Storage volum	,					•		ame ves	sel		200		(47)
If community h Otherwise if no	_			-			, ,	ore) onto	or 'O' in <i>(</i>	(17)			
Water storage		not wate	i (uno n	iciuues i	Hotalital	ieous cc	ווטט וטוווו	ers) erite	51 U III ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWl	n/day):				2.	24		(48)
Temperature f					`	• ,					.6		(49)
Energy lost fro				ear			(48) x (49)) =			34		(50)
b) If manufact		•			or is not	known:							, ,
Hot water stor	•			le 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	_		on 4.3										(==)
Temperature f			2h								0		(52) (53)
·							(47) × (54)) v (EQ) v ((F2)		0		, ,
Energy lost fro Enter (50) or		_	, KVVII/y	ear			(47) X (31)) x (52) x (55) =		0 34		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = ((55) × (41)	m	1.	.34		(55)
							. , ,	·		T			(50)
(56)m= 41.66 If cylinder contains	37.63	41.66	40.32	41.66 m = (56)m	40.32	41.66	41.66	40.32	41.66	40.32	41.66	iv Li	(56)
										1		XII	
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•		, ,						
(modified by			ı —		ı —			-	1	- 			(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 $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	0	00) + 3	03 × (41)	0	T 0	0	T 0	0	1	(61)
												J (59)m + (61)m	(-)
(62)m= 202.5	178.97	189.09	171.08	168.79	152.46	147.98	160.2		177.32	185.52	198.16	(39)111 + (01)111	(62)
Solar DHW input						1			ļ			I	(/
(add additiona										tion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from w	ı ıater hea	ter				ļ	l .			<u> </u>		J	
(64)m= 202.5	178.97	189.09	171.08	168.79	152.46	147.98	160.2	3 159.28	177.32	185.52	198.16]	
` '	Į.					l	C	utput from w	ater heate	er (annual)	l12	2091.37	(64)
Heat gains fro	m water	heating.	kWh/me	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61)ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	
(65)m= 97.68	86.92	93.22	86.26	86.48	80.07	79.56	83.6		89.31	91.06	96.24	اُ	(65)
include (57)	m in cal	culation o	of (65)m	only if c	vlinder	is in the	dwellir	na or hot w	ater is f	rom com	munity h	ı neating	
5. Internal g								3			• •	<u> </u>	
Metabolic gair	,												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 105.55	105.55	105.55	105.55	105.55	105.55	105.55	105.5	5 105.55	105.55	105.55	105.55		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equati	on L9 c	r L9a), a	lso se	e Table 5				•	
(67)m= 16.46	14.62	11.89	9	6.73	5.68	6.14	7.98	10.71	13.6	15.87	16.92]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	За), а	lso see Ta	ble 5				
(68)m= 184.63	186.54	181.71	171.44	158.46	146.27	138.12	136.2	1 141.03	151.31	164.29	176.48]	(68)
Cooking gains	calcula (ted in A	ppendix	L, equat	ion L15	or L15a	, also	see Table	5	•		•	
(69)m= 33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.5	33.55	33.55	33.55	33.55		(69)
Pumps and fa	ns gains	(Table 5	Ба)			•	•	•	•	•	•	•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)	•		•	•	•	•	•	
(71)m= -84.44	-84.44	-84.44	-84.44	-84.44	-84.44	-84.44	-84.4	4 -84.44	-84.44	-84.44	-84.44		(71)
Water heating	gains (T	able 5)				•	•	•	•	•	•	•	
(72)m= 131.3	129.35	125.3	119.8	116.23	111.2	106.93	112.4	1 114.35	120.04	126.47	129.36		(72)
Total interna	gains =				(66)m + (67)m	ı + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 387.05	385.17	373.57	354.9	336.09	317.82	305.85	311.2	5 320.76	339.62	361.29	377.42		(73)
6. Solar gain	s:							,	,	,			
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to	convert to the	ne applica	ble orienta	tion.		
Orientation:		actor	Area		Flu			g_ a	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast _{0.9x}	0.77	X	6.8	32	X	11.28	x	0.44	X	0.8	=	18.77	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	11.28	x	0.44	×	0.8	=	26.17	(75)
Northeast _{0.9x}	0.77	X	6.8	32	X	22.97	x	0.44	×	0.8	=	38.21	(75)
Northeast _{0.9x}	0.77	х	3.1	7	X :	22.97	x	0.44	x	0.8	=	53.28	(75)
Northeast _{0.9x}	0.77	X	6.8	32	х .	41.38	X	0.44	x	0.8	=	68.84	(75)

ът и г Г							1		_		_		_
Northeast _{0.9x}	0.77	X	3.1	7	x	41.38	X	0.44	×	0.8	=	95.99	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	67.96	X	0.44	X	0.8	=	113.05	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	67.96	X	0.44	X	0.8	=	157.65	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	91.35	X	0.44	X	0.8	=	151.97	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	91.35	X	0.44	X	0.8	=	211.91	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	97.38	X	0.44	X	0.8	=	162.01	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	97.38	X	0.44	X	0.8	=	225.92	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	91.1	X	0.44	X	0.8	=	151.56	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	91.1	X	0.44	X	0.8	=	211.34	(75)
Northeast 0.9x	0.77	X	6.8	32	x	72.63	X	0.44	X	0.8	=	120.83	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	72.63	X	0.44	X	0.8	=	168.48	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	50.42	X	0.44	X	0.8	=	83.88	(75)
Northeast _{0.9x}	0.77	X	3.1	17	x	50.42	X	0.44	X	0.8	=	116.97	(75)
Northeast _{0.9x}	0.77	Х	6.8	32	x	28.07	X	0.44	X	0.8	=	46.69	(75)
Northeast _{0.9x}	0.77	х	3.1	7	x	28.07	X	0.44	x	0.8	=	65.11	(75)
Northeast _{0.9x}	0.77	х	6.8	32	x	14.2	x	0.44	x	0.8	=	23.62	(75)
Northeast _{0.9x}	0.77	х	3.1	7	x	14.2	x	0.44	x	0.8		32.93	(75)
Northeast _{0.9x}	0.77	x	6.8	32	x	9.21	X	0.44	x	0.8	_	15.33	(75)
Northeast _{0.9x}	0.77	x	3.1	7	x	9.21	x	0.44	x	0.8		21.38	(75)
·							_						
Solar gains in	watts, cald	culated	for eacl	h month	l		(83)m	n = Sum(74)m .	(82)m				
			070.7	363.87	007		T					1	
(83)m= 44.95	91.49	164.83	270.7	303.67	387.	93 362.9	289	.31 200.85	111.8	56.55	36.7]	(83)
(83)m= 44.95 Total gains – i							289	.31 200.85	111.8	56.55	36.7		(83)
` '	nternal and					m , watts	600		451.42	<u> </u>	414.12]	(83)
Total gains – i	nternal and	d solar 538.4	(84)m = 625.6	= (73)m 699.96	+ (83)	m , watts		I			1		, ,
Total gains – i (84)m= 431.99	nternal and 476.66	d solar 538.4 rature ((84)m = 625.6 heating	= (73)m 699.96 season	+ (83) 705.	m , watts 75 668.75	600	.56 521.61			1	21	, ,
Total gains – i (84)m= 431.99 7. Mean inter	and temper during hear	d solar 538.4 rature (ating pe	(84)m = 625.6 heating eriods in	= (73)m 699.96 season the livi	+ (83) 705.	m, watts 75 668.75 ea from Tal	600	.56 521.61			1	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature	and tempe during hea	d solar 538.4 rature (ating pe	(84)m = 625.6 heating eriods in	= (73)m 699.96 season the livi	+ (83) 705.	m , watts 75 668.75 ea from Tal Table 9a)	600 ble 9	.56 521.61		2 417.84	1	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac	nternal and 476.66 Area tempe during heater for gain	d solar 538.4 rature (ating pe	(84)m = 625.6 heating eriods in ving are	= (73)m 699.96 season the livi	705.	ea from Tal Table 9a)	600 ble 9	.56 521.61 , Th1 (°C)	451.42	2 417.84	414.12	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac	tor for gail Feb 0.94	rature (ating pens for limes for lim	(84)m = 625.6 heating eriods in ving are Apr 0.84	= (73)m 699.96 season the livi ea, h1,m May 0.72	+ (83) 705. ng are (see Ju	ea from Tal Table 9a) n Jul	600 ble 9	.56 521.61 , Th1 (°C) ug Sep 5 0.72	451.42 Oct	2 417.84 Nov	414.12 Dec	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96	nternal and 476.66 and tempe during heator for gain Feb 0.94 at temperate	rature (ating pens for limes for lim	(84)m = 625.6 heating eriods in ving are Apr 0.84	= (73)m 699.96 season the livi ea, h1,m May 0.72	+ (83) 705. ng are (see Ju	ea from Tal Table 9a) n Jul 7 0.44	600 ble 9	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c)	451.42 Oct	2 417.84 Nov 0.94	414.12 Dec	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67	nternal and 476.66 and temperaturing heater for gain Feb 0.94 at temperature 18.9	rature (ating pens for li Mar 0.91 cure in li 19.35	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (fo	+ (83) 705. ng are (see	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7	600 ble 9 A 0 7 in T	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62	451.42 Oct 0.88	2 417.84 Nov 0.94	Dec 0.96	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96 Mean interna	nternal and 476.66 rnal tempe during head to for gain Feb 0.94 rtemperate 18.9 during head during head temperate 18.9 during head temperate 18.0 during head	rature (ating pens for li Mar 0.91 cure in li 19.35	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (fo	+ (83) 705. ng are (see	ea from Tall Table 9a) n Jul 7 0.44 steps 3 to 1 1 20.93	600 ble 9 A 0 7 in T	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C)	451.42 Oct 0.88	Nov 0.94	Dec 0.96	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96 Mean internation (87)m= 18.67 Temperature (88)m= 19.94	rnal tempe during head ctor for gain Feb 0.94 Il temperate 18.9 during head	rature (ating persons for limited in limite	heating eriods in Apr 0.84 iving are 19.96 eriods in 19.96	ea T1 (for 20.48)	+ (83) 705. ng are (see Ju 0.5 ollow 20.8 dwell 19.9	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 1 20.93 ing from Tal 1 19.97	600 ble 9 A 0. 7 in T 20 able 9	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C)	Oct 0.88	Nov 0.94	Dec 0.96	21	(84) (85) (86) (87)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac	nternal and 476.66 and temperaturing heat temperature 18.9 during heat 19.95 are tor for gain temperaturing heat 19.95 are tor for gain temperaturing heat 19.95 are tor for gain temperaturing heat 19.95 are tor for gain	rature (ating pens for li Mar 0.91 cure in li 19.35 ating pens for re	heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of details.	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 n rest of 19.96 welling,	+ (83) 705. ng are 1 (see 0.5 ollow 20.8 dwell 19.9 h2,m	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta	600 ble 9 A 0 7 in T 20 able 9 19	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97	Oct 0.88	Nov 0.94 19.22	Dec 0.96 18.63	21	(84) (85) (86) (87) (88)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95	nternal and 476.66 and tempe during here tor for gain Feb 0.94 at temperat 18.9 at temperat 19.95 at t	rature (ating pens for li Mar 0.91 cure in li 19.35 ating pens for re 0.9	heating eriods ir ving are 19.96 eriods ir 19.96 est of do 0.81	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 or rest of 19.96 welling, 0.67	+ (83) 705. ng are n (see 0.5 ollow 20.8 dwell 19.9 h2,m 0.5	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta 7 19.97 (see Table 0.35	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97	Oct 0.88 19.96 0.86	Nov 0.94	Dec 0.96	21	(84) (85) (86) (87)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac [86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95 Mean interna	nternal and 476.66 and tempe during heat temperate 18.9 and 19.95 are tor for gain 19.95 are tor for gain 19.95 are tor for gain 19.94 and temperate 18.9 are tor for gain 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.95 are	rature (ating persons for limited in limite	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest	ea T1 (for 20.48 m) rest of 19.96 welling, 0.67 of dwelling	+ (83) 705. ng are (see Ju 0.5 ollow 20.8 dwell 19.9 h2,m 0.5 ing T2	m , watts 75 668.75 ea from Tal Table 9a) n	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 11 0.65 1 to 7 in Table	Oct 0.88 19.96 0.86 e 9c)	Nov 0.94 19.22 19.96	Dec 0.96 18.63 19.95	21	(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95	nternal and 476.66 and tempe during heat temperate 18.9 and 19.95 are to for gain and 19.95 are to for gain and 19.95 are to for gain and 19.94 are temperate 18.9 are to for gain and 19.94 are temperate 19.95 are to for gain and 19.94 are temperate 19.94 are temperate 19.95 are tempera	rature (ating pens for li Mar 0.91 cure in li 19.35 ating pens for re 0.9	heating eriods ir ving are 19.96 eriods ir 19.96 est of do 0.81	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 or rest of 19.96 welling, 0.67	+ (83) 705. ng are n (see 0.5 ollow 20.8 dwell 19.9 h2,m 0.5	m , watts 75 668.75 ea from Tal Table 9a) n	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 41 0.65 4 to 7 in Table .9 19.59	Oct 0.88 19.96 0.86 e 9c) 18.71	Nov 0.94 19.22 19.96 0.93	Dec 0.96 18.63 19.95 0.96		(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac [86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95 Mean interna	nternal and 476.66 and tempe during heat temperate 18.9 and 19.95 are to for gain and 19.95 are to for gain and 19.95 are to for gain and 19.94 are temperate 18.9 are to for gain and 19.94 are temperate 19.95 are to for gain and 19.94 are temperate 19.94 are temperate 19.95 are tempera	rature (ating persons for limited in limite	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest	ea T1 (for 20.48 m) rest of 19.96 welling, 0.67 of dwelling	+ (83) 705. ng are (see Ju 0.5 ollow 20.8 dwell 19.9 h2,m 0.5 ing T2	m , watts 75 668.75 ea from Tal Table 9a) n	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 41 0.65 4 to 7 in Table .9 19.59	Oct 0.88 19.96 0.86 e 9c) 18.71	Nov 0.94 19.22 19.96	Dec 0.96 18.63 19.95 0.96	21	(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact [86)m= 0.96 Mean internation (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fact (89)m= 0.95 Mean internation (90)m= 16.84	nternal and 476.66 mal temperaturing head temperaturing head 18.9 during head 19.95 etor for gain 19.95 etor for gain 17.17	rature (ating pens for li Mar 0.91 ture in li 19.35 ating pens for re 0.9 ture in ti 17.82	heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest 18.68	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 n rest of 19.96 welling, 0.67 of dwell	+ (83) 705. ng are (see Ju 0.5 collow 20.8 dwell 19.9 h2,m 0.5 ing T2	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta 7 19.97 (see Table 0.35 2 (follow ste	600 ble 9 A 0.4 7 in T 20 able 9 19. 9a) 0.4 eps 3	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 41 0.65 4 to 7 in Table .9 19.59	Oct 0.88 19.96 0.86 e 9c) 18.71	Nov 0.94 19.22 19.96 0.93 17.65 ring area ÷ (4	Dec 0.96 18.63 19.95 0.96		(84) (85) (86) (87) (88) (89) (90) (91)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95 Mean interna (90)m= 16.84	nternal and 476.66 nal tempe during heater for gain 18.9 during heater 19.95 etor for gain 19.95 etor for gain 17.17 lt temperat 18.13	rature (ating pens for li Mar 0.91 ture in li 19.35 ating pens for re 0.9 ture in ti 17.82 ture (for	heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest 18.68	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 n rest of 19.96 welling, 0.67 of dwell 19.38	+ (83) 705. ng are (see Ju 0.5 collow 20.8 dwell 19.9 h2,m 0.5 ing T2 19.6	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta 7 19.97 (see Table 0.35 2 (follow ste 3 19.92 = fLA × T1 6 20.48	600 ble 9 A 0.4 7 in T 20 able 9 19. 9a) 0.4 eps 3 19 + (1 20.	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 11 0.65 1 to 7 in Table .9 19.59 - fLA) × T2 46 20.17	Oct 0.88 19.96 19.96 0.86 e 9c) 18.71 19.41	Nov 0.94 19.22 19.96 0.93 17.65 ving area ÷ (4)	Dec 0.96 18.63 19.95 0.96		(84) (85) (86) (87) (88) (89)

(93)m= 17.86	18.13	18.67	19.4	20	20.36	20.48	20.46	20.17	19.41	18.53	17.81		(93)
8. Space hea									. —				
Set Ti to the i the utilisation			•		ied at ste	ep 11 of	Table 9b	o, so tha	t II,m=(/6)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	-										
(94)m= 0.94	0.92	0.88	0.8	0.68	0.53	0.4	0.45	0.67	0.84	0.91	0.94		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 403.97	437.15	472.75	499.23	473.25	371.15	267.31	272.1	347.97	379.63	381.91	389.55		(95)
Monthly avera		1			r	1	1			1			(0.0)
(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= 1026.54		an intern	782.5	617.1	Lm , VV =	=[(39)m 285.63	x [(93)m- 297.81	- (96)m 448.31	655.21	853.85	1021.59		(97)
` '	l	l .			L	l				l	1021.59		(37)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m=													
(66)	0.00.	0000	200.00	.07.02				l per year			L	2498.06	(98)
Space heatin	a roquir	omont in	k\Mb/m²	l/voor			. 010	. poi you	(,) ca.	<i>)</i> • • • • • • • • • • • • • • • • • • •	· /1	38.61	╡``
Space heating requirement in kWh/m²/year 9b. Energy requirements – Community heating scheme													(99)
9b. Energy red This part is use				Ĭ			ting prov	idad by	a comm	unity col	nomo		
Fraction of spa			• .		•		• .	•		uriity Sci	ieilie.	0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =					İ	1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The µ	orocedure	allows for	CHP and เ	up to four	other heat	sources; tl	he latter	
includes boilers, h		-			rom powe	r stations.	See Apper	ndix C.			ı		¬,,,,,
Fraction of hea			•									1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for conf	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	g											kWh/yea	<u>-</u>
Annual space	heating	requiren	nent									2498.06	
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	= [2622.96	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/sup	plemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =	Ī	0	(309)
Water heating	1										•		
Annual water h		equirem	ent									2091.37	7
If DHW from c											·		_
Water heat fro	m Comr	nunity bo	oilers					(64) x (30)3a) x (30	5) x (306) :	=	2195.94	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	48.19	(313)
Cooling System	m Energ	y Efficie	ncy Ratio	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		ĺ	0	(315)
Electricity for p	oumps a	nd fans	within dv	velling (1	Γable 4f)	:							_
mechanical ve							outside					125.51	(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	b) + (330g) =		125.51	(331)
Energy for lighting (calculated in Appen	dix L)				290.68	(332)
12b. CO2 Emissions – Community heat	ting scheme					
		Energy	Emission fac	tor E	missions	
		kWh/year	kg CO2/kWh	kç	g CO2/year	
CO2 from other sources of space and w	vater 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	89.5	(367a)
CO2 associated with heat source 1	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.22	=	1163	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	25.01	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	2)	=	1188.01	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1188.01	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	65.14	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	150.86	(379)
Total CO2, kg/year	sum of (376)(382) =				1404.01	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				21.7	(384)

El rating (section 14)

(385)

82.85

		l lser I	Details:										
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096					
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12					
	F	Property	Address	: 5_02 -	2B3P								
Address:	Address: 1. Overall dwelling dimensions:												
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)				
Ground floor				(1a) x		2.65	(2a) =	171.45	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	64.7	(4)									
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	171.45	(5)				
2. Ventilation rate:													
	main seconda heating heating	ry	other		total			m³ per hou	ır				
Number of chimneys		+ [0] = [0	X 4	40 =	0	(6a)				
Number of open flues	0 + 0	╗┾╒	0	Ī = Ī	0	x2	20 =	0	(6b)				
Number of intermittent fa	ins				2	x ²	10 =	20	(7a)				
Number of passive vents	3			Ī	0	x ²	10 =	0	(7b)				
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)				
				_									
				_				nanges per ho	_				
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	20		÷ (5) =	0.12	(8)				
Number of storeys in t		, a to (_/ ,			o (o) to	(1.5)		0	(9)				
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)				
	1.25 for steel or timber frame or resent, use the value corresponding to			•	ruction			0	(11)				
deducting areas of openi		o irie grea	iter wall are	a (aner									
•	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)				
If no draught lobby, en	•							0	(13)				
Window infiltration	s and doors draught stripped		0.25 - [0.2	P x (14) ÷ 1	1001 =			0	(14)				
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)				
	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	5	(17)				
If based on air permeabi	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) = ((16)				0.37	(18)				
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed							
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (²	19)] =			3 0.78	(19) (20)				
Infiltration rate incorpora	ting shelter factor		(21) = (18		,-			0.78	(21)				
Infiltration rate modified f	•							0.20	` ′				
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp	peed from Table 7							_					
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7						
Wind Factor (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						
	•	-	-	-	-	-	-	•					

Adjusted infiltr	ration rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33]	
<i>Calculate effe</i> If mechanic		•	rate for t	he appli	cable ca	se							(2:
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(2:
If balanced wit									, , ,			0	(2:
a) If balance	ed mech:	anical ve	entilation	with he	at recove	erv (MV	HR) (24a	a)m = (2)	2b)m + (23b) x [1 – (23c)		(2)
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	ed mech:	anical ve	entilation	without	heat red	overy (ľ	MV) (24b	o)m = (22	2b)m + (2	23b)	<u>!</u>	J	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h	nouse ex m < 0.5 ×			•	•				5 × (23b))	!	_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)r	ventilation $m = 1$, the			•	•				0.5]	<u>!</u>	<u>!</u>	_	
24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56]	(2
Effective air	change	rate - er	nter (24a	or (24k	o) or (24	c) or (24	d) in box	x (25)				_	
25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56]	(2
3. Heat losse	s and he	eat loss i	naramet	⊃r·									
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-		A X k kJ/K
Vindows Type	e 1				6.76	_x 1	/[1/(1.4)+	0.04] =	8.96				(2
Vindows Type	e 2				3.14	x1	/[1/(1.4)+	0.04] =	4.16				(2
Valls Type1	57.	5	16.1	В	41.32	<u>x</u>	0.18		7.44				(2
Valls Type2	14.8	8	0		14.8	x	0.18	=	2.66	= [$\exists \ \ $	(2
Roof	64.	7	0		64.7	X	0.13	<u> </u>	8.41			= =	(3
otal area of e	elements	, m²			137								(3
for windows and * include the are					alue calcul	ated using	g formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragrapl	h 3.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				39.96	6 (3
leat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	582.3	3 (3
hermal mass	s parame	ter (TMF	= Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design asses				construct	ion are no	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
an be used inste hermal bridg				ısina Ar	nendiy l	<i>(</i>						6.05	(3
details of therm	•	,		Ο.	•	`						6.85	(3
otal fabric he			. (30)	10	,			(33) +	(36) =			46.8	1 (3
entilation ha	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))		
CHILIAUUH HE	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan			 		30.35	30.35	30.24	30.57	30.93	31.18	31.44	1	(3
Jan	31.86	31.72	31.05	30.93	30.33	00.00					1	1	(0
Jan 32	31.86		31.05	30.93	30.33	00.00	1		= (37) + (37)	1——— 38)m		.	(0
Jan	31.86		77.87	77.74	77.16	77.16	77.06		= (37) + (37) + (37)	38)m 77.99	78.26]	(0

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.22	1.22	1.21	1.2	1.2	1.19	1.19	1.19	1.2	1.2	1.21	1.21		
						ı	ı	,	Average =	Sum(40) ₁ .	12 /12=	1.2	(40)
Number of day	1	nth (Tab	le 1a)		ı			ı	1	i			
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 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		11		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.33		(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.	ļ.			
(44)m= 92.77	89.39	86.02	82.65	79.27	75.9	75.9	79.27	82.65	86.02	89.39	92.77		
						!	!			m(44) ₁₁₂ =		1012.02	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 137.57	120.32	124.16	108.25	103.87	89.63	83.05	95.31	96.44	112.4	122.69	133.23		_
If instantaneous v	vater heati	na at noint	of use (no	hot water	r storage)	enter∩in	hoves (46		Total = Su	m(45) ₁₁₂ =	-	1326.91	(45)
			,	·	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , I	40.00	104	40.00		(46)
(46)m= 20.64 Water storage	18.05 loss:	18.62	16.24	15.58	13.44	12.46	14.3	14.47	16.86	18.4	19.98		(46)
Storage volum) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage					4.144	<i>,</i> , , ,							
a) If manufact				or is kno	wn (kVVI	n/day):				1.	65		(48)
Temperature f										0.	54		(49)
Energy lost from b) If manufact		•			or ic not		(48) x (49)) =		0.	89		(50)
Hot water stor			•								0		(51)
If community h	-			- (7,					<u> </u>		(- /
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	89		(55)
Water storage	loss cal	culated t	or each	month	_	_	((56)m = ((55) × (41)	m 	_			
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(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= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	loss (ar	nnual) fro	m Table	<u></u>							0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 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 $(61)m = (60) \div 365 \times (41)m$													
	1	0	0	0 1)111 =	00) - 3	000 × (41			Τ ,	Τ ο	Ι ο	1	(61)
(61)m= 0	0						(00)	0	0	(40)	(57)	(50)	(01)
	`		157.53				`		` 	` 	ì ´	· (59)m + (61)m 1	(62)
(62)m= 188.5		175.09		154.79	138.91	133.98	146.2		163.32	171.97	184.16]	(62)
Solar DHW inpu (add addition									ar contribu	tion to wat	er neating)	1	
(63)m= 0	0	0	0	0	applie:	0 see Ap	0		0	0	0	1	(63)
			0		U	1 "			1 0			J	(00)
Output from v	_		157.50	154.79	120.01	1422.00	146	23 145.73	163.32	171.97	104.16	1	
(64)m= 188.5	166.32	175.09	157.53	154.79	138.91	133.98	146.2				184.16	1926.53	(64)
			1.10/1./	41 0 0	- /	- (45)		output from w](04)
Heat gains fr		$\overline{}$				- ` 	·		-``	- ` 	- ` ´ 	1] 7	(05)
(65)m= 86.48		82.02	75.42	75.28	69.23	68.36	72.4		78.11	80.22	85.04]	(65)
include (57	')m in cald	culation o	of (65)m	only if c	ylinder	is in the	dwellii	ng or hot v	vater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts							_		-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 105.55	105.55	105.55	105.55	105.55	105.55	105.55	105.5	55 105.55	105.55	105.55	105.55]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5					
(67)m= 16.46	14.62	11.89	9	6.73	5.68	6.14	7.98	10.71	13.6	15.87	16.92]	(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	lso see Ta	able 5	-		-	
(68)m= 184.63	186.54	181.71	171.44	158.46	146.27	138.12	136.2	21 141.03	151.31	164.29	176.48]	(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also	see Table	e 5	•	•	•	
(69)m= 33.55		33.55	33.55	33.55	33.55	33.55	33.5		33.55	33.55	33.55	1	(69)
Pumps and fa	ans gains	(Table 5	ia)				•				•	J	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. e	evaporatio	n (negat	ive valu	es) (Tab	le 5)		<u> </u>	<u> </u>	1	Į.		1	
(71)m= -84.44	 	-84.44	-84.44	-84.44	-84.44	-84.44	-84.4	4 -84.44	-84.44	-84.44	-84.44	1	(71)
Water heating				l		1	<u> </u>		<u> </u>		1	J	
(72)m= 116.24	<u>`</u>	110.25	104.75	101.18	96.15	91.88	97.3	5 99.3	104.99	111.42	114.3	1	(72)
` '			101.70	101110				m + (69)m +			1	J	()
Total interna (73)m= 374.99		361.52	342.85	324.03	305.76	<u>, , , , , , , , , , , , , , , , , , , </u>	299.		327.56	<u> </u>	365.36	1	(73)
6. Solar gair		301.32	342.03	324.03	303.70	293.0	299.	2 300.7	327.30	343.24	303.30	1	(10)
Solar gains are		using solai	r flux from	Table 6a	and asso	ciated equa	ations to	convert to t	he applica	ble orienta	tion.		
Orientation:		•	Area			ux		g_		FF		Gains	
onomation.	Table 6d		m ²			able 6a		Table 6b	7	able 6c		(W)	
Northeast 0.9x	0.77	x	6.7	76	х	11.28] _x [0.63	x [0.7		23.31	(75)
Northeast 0.9x		×	3.1		x	11.28] ^ L] _x [0.63	^ L	0.7		32.48](75)
Northeast 0.9x		x	6.7		x	22.97] ^ L] _x [0.63	^ L	0.7	= -	47.45](75)
Northeast 0.9x] ^ L] _x [≓		=](75)](75)
Northeast 0.9x		X	3.1		×	22.97	:	0.63	×	0.7	=	66.12	-
14011116a51 (J.9X	0.77	X	6.7	' b	X	41.38	X	0.63	X	0.7	=	85.49	(75)

r							, ,		_				_
Northeast _{0.9x}	0.77	X	3.1	4	X	41.38	X	0.63	X	0.7	=	119.12	(75)
Northeast _{0.9x}	0.77	X	6.7	6	x	67.96	X	0.63	X	0.7	=	140.39	(75)
Northeast _{0.9x}	0.77	X	3.1	4	x	67.96	x	0.63	X	0.7	=	195.64	(75)
Northeast _{0.9x}	0.77	X	6.7	6	X	91.35	X	0.63	X	0.7	=	188.72	(75)
Northeast _{0.9x}	0.77	X	3.1	4	x	91.35	x	0.63	x	0.7	=	262.97	(75)
Northeast _{0.9x}	0.77	X	6.7	'6	x	97.38	x	0.63	X	0.7	=	201.19	(75)
Northeast 0.9x	0.77	х	3.1	4	x	97.38	x	0.63	x	0.7	=	280.36	(75)
Northeast _{0.9x}	0.77	х	6.7	'6	x	91.1	X	0.63	x	0.7	=	188.21	(75)
Northeast _{0.9x}	0.77	х	3.1	4	x	91.1	X	0.63	x	0.7	=	262.27	(75)
Northeast 0.9x	0.77	х	6.7	6	x	72.63	x	0.63	x	0.7	=	150.04	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	72.63	x	0.63	x	0.7		209.08	(75)
Northeast _{0.9x}	0.77	x	6.7	6	x	50.42	x	0.63	x	0.7		104.17	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	50.42	x	0.63	x	0.7	=	145.15	(75)
Northeast _{0.9x}	0.77	x	6.7	6	x	28.07	x	0.63	×	0.7		57.99	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	28.07	х	0.63	x	0.7	-	80.8	(75)
Northeast _{0.9x}	0.77	x	6.7	6	x	14.2	х	0.63	x	0.7	=	29.33	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	14.2	х	0.63	x	0.7	-	40.87	(75)
Northeast _{0.9x}	0.77	х	6.7	6	x	9.21	х	0.63	x	0.7	=	19.04	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	9.21	х	0.63	x	0.7	= =	26.53	(75)
Solar gains in	watts, calc	ulated	for eacl	n month			(83)m	ı = Sum(74)m .	(82)m				
(83)m= 55.79	113.57 2	204.61	336.03	451.69	481.55	450.48	359	.13 249.32	138.7	9 70.2	45.56		(83)
Total gains – i	internal and	d solar	(84)m =	(73)m	+ (83)m	, watts						•	
(84)m= 430.78	486.69 5	66.13	678.88	775.72	787.31	744.28	658	.33 558.02	466.3	5 419.44	410.93		(84)
7. Mean inter	rnal temper	rature	(heating	season)								
Temperature	during hea	ating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gair	ns for I	iving are	ea, h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.93	0.8	0.6	0.45	0.5	0.81	0.97	0.99	1		(86)
Mean interna	al temperati	ure in I	iving are	ea T1 (fo	ollow st	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.73	19.88	20.16	20.56	20.85	20.97	20.99	20.	99 20.88	20.49	20.04	19.7		(87)
Temperature	during hea	ating p	eriods ir	rest of	dwellin	a from Ta	able 9). Th2 (°C)			•	•	
(88)m= 19.91	 -	19.91	19.92	19.92	19.93	19.93	19.	<u> </u>	19.92	19.92	19.91		(88)
(30)						<u>.</u>				_!			
` ′	tor for gain		est of d	welling	h2 m (s	ee Table	9a)						
Utilisation fac	- T	ns for r			· `	T .	T –	1 0.73	0.95	0.99	1		(89)
Utilisation fac	0.99	ns for r 0.98	0.91	0.74	0.51	0.34	0.4		0.95	0.99	1		(89)
Utilisation faction (89)m= 1 Mean internal	0.99	ns for r 0.98 ure in t	0.91 the rest	0.74 of dwell	0.51 ng T2 (0.34	0.4 eps 3	to 7 in Tabl	e 9c)		I		, ,
Utilisation fac	0.99	ns for r 0.98	0.91	0.74	0.51	0.34	0.4	to 7 in Tabl	e 9c)	18.69	18.19	0.50	(90)
Utilisation factors (89)m= 1 Mean internation (90)m= 18.22	0.99 al temperati	ns for r 0.98 ure in t	0.91 the rest 19.41	0.74 of dwell 19.78	0.51 ing T2 (0.34 follow ste 19.92	0.4 eps 3	to 7 in Tabl 92 19.83	e 9c)		18.19	0.56	, ,
Utilisation factors (89)m= 1 Mean internation (90)m= 18.22 Mean internation factors (189)m= 1	0.99 al temperation 18.44	ns for r 0.98 ure in t 18.86	0.91 the rest 19.41 r the wh	0.74 of dwell 19.78 ole dwe	0.51 ng T2 (19.91	0.34 follow ste 19.92 fLA × T1	0.4 eps 3 19.9	to 7 in Tabl 92 19.83 f fLA) × T2	e 9c) 19.33 LA = Liv	18.69 ving area ÷ (18.19	0.56	(90)
Utilisation factors (89)m= 1 Mean internation (90)m= 18.22	0.99 al temperati 18.44 al temperati 19.24	ns for r 0.98 ure in 1 18.86 ure (fo	0.91 the rest 19.41 r the wh	0.74 of dwell 19.78 ole dwe 20.38	0.51 Ing T2 (19.91 Illing) =	0.34 follow ste 19.92 fLA × T1 20.52	0.4 eps 3 19.9 + (1 20.9	to 7 in Tabl 92 19.83 f - fLA) × T2 52 20.42	e 9c) 19.33 FLA = Liv	18.69 ving area ÷ (4	18.19	0.56	(90)

	(02)
(93)m= 19.06 19.24 19.59 20.05 20.38 20.5 20.52 20.52 20.42 19.98 19.44	19.03 (93)
8. Space heating requirement	no coloniato
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	re-calculate
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 0.91 0.77 0.56 0.4 0.47 0.77 0.96 0.99	1 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	409.16 (95)
Monthly average external temperature from Table 8	(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 1163.59 1128.33 1027.69 868.24 674.71 455.36 302.57 317.27 488.98 728.92 962.65	1160.7 (97)
	1160.7 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m=	559.15
Total per year (kWh/year) = Sum(98)	
Space heating requirement in kWh/m²/year	42.32 (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)	
546.92 434.48 354.47 178.76 59.52 0 0 0 0 210.79 394.19	559.15
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
584.94 464.68 379.11 191.18 63.66 0 0 0 0 225.44 421.59	598.02
Total (kWh/year) =Sum(211) _{15,1012} =	2928.63 (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	0
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)
Water heating	
Output from water heater (calculated above)	
	184.16
Efficiency of water heater	79.8 (216)
(217)m= 87.49 87.26 86.66 85.15 82.51 79.8 79.8 79.8 85.5 86.96	87.59 (217)
Fuel for water heating, kWh/month	
$(219)m = (64)m \times 100 \div (217)m$ $(240)m = (245)m \times 100 \times (217)m$	240.25
(219)m= 215.44 190.6 202.04 185 187.61 174.07 167.89 183.25 182.61 191.03 197.76 Total = Sum(219a) ₁₁₂ =	210.25
	2287.57 (219)
Annual totals Space heating fuel used, main system 1	kWh/year 2928.63
apasaaaanig taat aaaa, mani ayatani i	2020.00

Water heating fuel used				2287.57	٦
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 (23	0a)(230g) =		75	(231)
Electricity for lighting				290.68	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	632.58	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	494.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1126.7	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	150.86	(268)
Total CO2, kg/year	su	m of (265)(271) =		1316.49	(272)

TER =

(273)

20.35

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:43:07

Proiect Information:

Assessed By: Vitaliy Troyan (STRO018096) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 63.8m²

Site Reference: Tottenham Mews Plot Reference: 5_03 - 2B3P

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 20.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 23.03 kg/m² Fail

Excess emissions = 2.26 kg/m² (10.9 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 61.5 kWh/m²

Excess energy = $1.22 \text{ kg/m}^2 (02.0 \%)$

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

Fail

OK

OK

Regulations Compliance Report

Controls			
Space heating controls Hot water controls:	Charging system linked t Cylinderstat	o use of community heating, program	nmer and TRVs OK OK
Low energy lights			
Percentage of fixed lights wi	th low-energy fittings	100.0%	
Minimum		75.0%	OK
Mechanical ventilation			
Continuous supply and extra	act system		
Specific fan power:	•	0.48	
Maximum		1.5	OK
MVHR efficiency:		78%	
Minimum		70%	OK
Summertime temperature			
Overheating risk (Thames va	alley):	Medium	OK
sed on:			
Overshading:		Average or unknown	
Windows facing: North East		9.51m²	
Windows facing: South East		6.82m²	
Ventilation rate:		4.00	
Blinds/curtains:		Dark-coloured curtain or r	oller blind
		Closed 100% of daylight I	nours
) Key features			
Air permeablility		3.0 m³/m²h	
Windows U-value		1.1 W/m ² K	

Community heating, heat from boilers - mains gas

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	- 036 F1	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa		Versio	n: 1.0.5.12			
Address	F	Property	Address	: 5_03 -	2B3P				
Address: 1. Overall dwelling dime	ensions:								
The Overall awailing all the		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			63.8	(1a) x	2	2.65	(2a) =	169.07	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	63.8	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.07	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	_ = [0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x -	10 =	0	(7a)
Number of passive vents	3			Ē	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			Ē	0	x	40 =	0	(7c)
				<u>L</u>				_	
				_			Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continuo fi	0		÷ (5) =	0	(8)
Number of storeys in the		50 to (17),	ourier wise (continue n	0111 (9) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t	o the grea	ter wall are	ea (after					
,	floor, enter 0.2 (unsealed) or (.1 (seal	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	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere Shelter factor	20		(20) = 1 -	[0.075 x (*	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		- /1			0.65	(21)
Infiltration rate modified f	•		, , ,	, , ,				0.13	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7			•		•		•	
$(22)m = \begin{bmatrix} 5.1 & 5 \end{bmatrix}$	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (20-) (2	2)m : 4	_	-	-	-	-	-	-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	<u> </u>	1.08	1.12	1.18]	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32	<u> </u>	1.00	1.12	1.10	J	

djusted 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		
<i>alculate effe</i> If mechanic		_	rate for t	he appli	cable ca	se		-		-	-	0.5	(2:
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2:
If balanced with	heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				66.3	(2:
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.33	0.33	0.32	0.31	0.31	0.29	0.29	0.29	0.3	0.31	0.31	0.32		(2
b) If balance	d mech	anical ve	entilation	without	heat red	overy (I	MV) (24b)m = (22	2b)m + (23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h					•		on from (c) = (22b		5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)r					•		on from I 0.5 + [(2		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 box	x (25)	-	-	-	-	
25)m= 0.33	0.33	0.32	0.31	0.31	0.29	0.29	0.29	0.3	0.31	0.31	0.32		(2
3. Heat losse	s and he	eat loss i	paramete	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-		A X k kJ/K
/indows Type	1				3.17	x1	/[1/(1.1)+	0.04] =	3.34				(2
Vindows Type	2				6.82	x1	/[1/(1.1)+	0.04] =	7.19				(2
/alls Type1	81.0	6	16.3	3	65.27	×	0.2		13.05				(2
/alls Type2	15.0	6	0		15.6	X	0.19	= [2.89				(2
oof	63.8	8	0		63.8	X	0.14	= [8.93				(3
otal area of e	lements	, m²			161								(3
for windows and include the area						ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				42.08	(3
eat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	574.2	(3
hermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design asses: an be used inste				construct	ion are no	known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
hermal bridge				usina An	nendix k	<						24.15	(3
details of therma	`	,		• .	•	•						24.15	(c
otal fabric he	at loss							(33) +	(36) =			66.23	(3
entilation hea	at loss ca	alculated	d monthly	<u>/</u>				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 18.47	18.29	18.12	17.23	17.05	16.16	16.16	15.98	16.51	17.05	17.4	17.76		(3
eat transfer of	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
9)m= 84.7	84.52	84.35	83.46	83.28	82.39	82.39	82.21	82.75	83.28	83.63	83.99		

	meter (F	HLP), W/	′m²K					(40)m	= (39)m ÷	(4)			
)m= 1.33	1.32	1.32	1.31	1.31	1.29	1.29	1.29	1.3	1.31	1.31	1.32		_
ımber of day	ıc in moı	oth (Tabí	lo 1a\					,	Average =	Sum(40) ₁	12 /12=	1.31	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30 30	31	30	31		(4
) <u> </u>		<u> </u>	00	<u> </u>			<u> </u>		<u> </u>		<u> </u>		()
. Water heat	ing ener	rgy requi	irement:								kWh/yea	ar:	
sumed 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.		09		(4
nnual averag duce the annua t more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.76		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage ii	า litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
)m= 92.14	88.79	85.44	82.09	78.74	75.39	75.39	78.74	82.09	85.44	88.79	92.14		
aran a antant of	hat water	used sel	laulatad m	anthly 1	100 v Vd r		Tm / 260/			m(44) ₁₁₂ =		1005.13	(
ergy content of													
)m= 136.64	119.5	123.32	107.51	103.16	89.02	82.49	94.66	95.79	111.63	121.85 m(45) ₁₁₂ =	132.33	1317.89	
stantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	111(43)112 =		1317.09	
)m= 20.5	17.93	18.5	16.13	15.47	13.35	12.37	14.2	14.37	16.74	18.28	19.85		(
ater storage						<u> </u>		!		!			
orage volum	,		•			Ū		ame ves	sel		200		(
community herwise if no	•			•			` '	ers) ente	er '∩' in <i>(</i>	(47)			
ater storage		not wate	,, (a.110 11	10100001	notantai	10000 00	11101 0011	oro, orice) iii (71)			
If manufact	urer's de	eclared lo	oss facto	or is kno	wn (kWh	n/day):				2.	24		(
mperature fa	actor fro	m Table	2b							0	.6		(
ergy lost fro		-	-				(48) x (49)) =		1.	34		(
If manufact t water stora			-								0		(
community h	•			0 2 (, 0, 00	•97					<u> </u>		V
lume factor	from Tal	ble 2a									0		(
mperature fa	actor fro	m Table	2b								0		(
		storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(
• •	54) in (5	•								1.	34		(
nter (50) or (culated f	or each	month		r	((56)m = ((55) × (41)	m	1			
nter (50) or (loss cal	- diated i						1 40 00		1 40 00			
nter (50) or (ater storage)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(
nter (50) or (ater storage)m= 41.66	37.63	41.66										Н	·
nter (50) or (ater storage	37.63	41.66										Н	(!
nter (50) or (ater storage) m= 41.66 //inder contains m= 41.66 mary circuit	37.63 37.63 loss (an	41.66 d solar stor 41.66 nnual) fro	40.32 m Table	m = (56)m 41.66	x [(50) – (40.32	H11)] ÷ (5 41.66	0), else (5 41.66	7)m = (56) 40.32	m where (H11) is fro	m Appendix	н	·
ater storage 41.66 vlinder contains	37.63 s dedicated 37.63 loss (an loss cal	41.66 d solar stor 41.66 annual) fro	rage, (57)r 40.32 om Table for each	m = (56)m 41.66 e 3 month (x [(50) - (40.32 59)m = (H11)] ÷ (5 41.66 (58) ÷ 36	0), else (5 41.66 65 × (41)	7)m = (56) 40.32	m where (H11) is fro	m Appendix	Н	(

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$												
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	1 11101111111 1 0	01)111 =	00) + 3	05 × (41)	0	0	0	T 0	0	1	(61)
Total heat required f										ļ	(50)m + (61)m	(-)
(62)m= 201.56 178.1		170.34	168.09	151.85	147.42	159.5		176.56	184.69	197.25	(39)111 + (01)111	(62)
Solar DHW input calculat											i	(/
(add additional lines								Continou	tion to wate	or ricating)		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water h	 eater	<u> </u>	<u> </u>		<u> </u>	l		<u> </u>		<u> </u>	1	
(64)m= 201.56 178.1		170.34	168.09	151.85	147.42	159.5	8 158.62	176.56	184.69	197.25		
· · <u>L </u>		<u> </u>	l			0	utput from w	ater heate	er (annual) ₁	l12	2082.35	(64)
Heat gains from wat	er heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m] + 0.8 x	k [(46)m	ı + (57)m	+ (59)m	1	•
(65)m= 97.37 86.69		86.01	86.24	79.86	79.37	83.4		89.06	90.78	95.94	ĺ	(65)
include (57)m in c	alculation	of (65)m	only if c	vlinder i	s in the o	dwellir	g or hot w	ater is f	rom com	munity h	ı ıeating	
5. Internal gains (s		. ,		•						,		
Metabolic gains (Tal			,									
Jan Fel		Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 104.34 104.3	4 104.34	104.34	104.34	104.34	104.34	104.3	4 104.34	104.34	104.34	104.34		(66)
Lighting gains (calcu	lated in A	ppendix	L, equati	on L9 o	r L9a), a	lso se	e Table 5					
(67)m= 16.26 14.44	11.75	8.89	6.65	5.61	6.06	7.88	10.58	13.43	15.68	16.71		(67)
Appliances gains (ca	alculated in	n Append	dix L, eq	uation L	13 or L1	3a), a	so see Ta	ble 5	•	•	'	
(68)m= 182.42 184.3	1 179.54	169.39	156.57	144.52	136.47	134.5	8 139.35	149.5	162.32	174.37		(68)
Cooking gains (calc	ulated in A	ppendix	L, equat	ion L15	or L15a)), also	see Table	5	•	•	•	
(69)m= 33.43 33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	1	(69)
Pumps and fans gai	ns (Table	 5a)					•				•	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evapora	tion (nega	tive valu	es) (Tab	le 5)	•		•	•	•		•	
(71)m= -83.47 -83.4	7 -83.47	-83.47	-83.47	-83.47	-83.47	-83.4	7 -83.47	-83.47	-83.47	-83.47		(71)
Water heating gains	(Table 5)	•					-		-		•	
(72)m= 130.88 128.9	4 124.92	119.46	115.92	110.92	106.68	112.1	2 114.05	119.7	126.09	128.95		(72)
Total internal gains	; =	•		(66))m + (67)m	ı + (68)ı	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 383.86 382	370.52	352.04	333.43	315.36	303.52	308.8	8 318.28	336.94	358.39	374.34		(73)
6. Solar gains:					•	•		•	•			
Solar gains are calculate	ed using sola	r flux from	Table 6a	and assoc	iated equa	itions to	convert to th	ne applica	ble orienta	tion.		
Orientation: Access		Area		Flu			g_ T-1-101-	_	FF		Gains	
Table (od	m²		1a	ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast _{0.9x} 0.	77 ×	3.1	17	X 1	11.28	x	0.44	X	0.8	=	26.17	(75)
Northeast _{0.9x} _{0.}	77 ×	3.1	17	x	22.97	x	0.44	x	0.8	=	53.28	(75)
Northeast 0.9x 0.	77 ×	3.1	17	X Z	11.38	×	0.44	x	0.8	=	95.99	(75)
Northeast 0.9x 0.	77 ×	3.1	17	x (67.96	_ x	0.44	x	0.8	=	157.65	(75)
Northeast _{0.9x} 0.	77 ×	3.1	17	x (91.35	x	0.44	x	0.8	=	211.91	(75)

Northpact o o		_		$\overline{}$							_		_
Northeast _{0.9x}	0.77	X	3.1	7	×	97.38	X	0.44	X	0.8	=	225.92	(75)
Northeast _{0.9x}	0.77	X	3.1	.7	x	91.1	Х	0.44	X	0.8	=	211.34	(75)
Northeast _{0.9x}	0.77	X	3.1	7	X	72.63	X	0.44	X	0.8	=	168.48	(75)
Northeast 0.9x	0.77	X	3.1	7	x	50.42	X	0.44	X	0.8	=	116.97	(75)
Northeast _{0.9x}	0.77	X	3.1	7	X	28.07	X	0.44	X	0.8	=	65.11	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	14.2	x	0.44	х	0.8	=	32.93	(75)
Northeast 0.9x	0.77	X	3.1	7	x	9.21	x	0.44	X	0.8	=	21.38	(75)
Southeast 0.9x	0.77	X	6.8	32	x	36.79	X	0.44	X	0.8	=	61.21	(77)
Southeast 0.9x	0.77	X	6.8	32	x	62.67	X	0.44	x	0.8	=	104.27	(77)
Southeast 0.9x	0.77	x	6.8	32	x	85.75	X	0.44	X	0.8	=	142.66	(77)
Southeast 0.9x	0.77	x	6.8	32	x	106.25	x	0.44	X	0.8		176.76	(77)
Southeast 0.9x	0.77	x	6.8	32	x	119.01	x	0.44	X	0.8		197.99	(77)
Southeast 0.9x	0.77	x	6.8	32	x	118.15	x	0.44	x	0.8		196.56	(77)
Southeast 0.9x	0.77	x	6.8	32	x	113.91	x	0.44	x	0.8	=	189.5	(77)
Southeast 0.9x	0.77	x	6.8	32	x	104.39	x	0.44	х	0.8	=	173.67	(77)
Southeast 0.9x	0.77	x	6.8	32	x	92.85	x	0.44	x	0.8	=	154.47	(77)
Southeast 0.9x	0.77	x	6.8	32	x	69.27	x	0.44	x	0.8	=	115.24	(77)
Southeast 0.9x	0.77	x	6.8	32	x	44.07	x	0.44	x	0.8	=	73.32	(77)
Southeast 0.9x	0.77	x	6.8	32	x	31.49	x	0.44	x	0.8	=	52.38	(77)
_					_		-						
Solar gains in	watts, calc	ulated	for eacl	h month			(83)m	n = Sum(74)m .	(82)m				
(83)m= 87.39		238.65	334.41	409.9	422.	48 400.84	342	.15 271.44	180.35	106.25	73.76		(83)
Total gains – ir	nternal and	solar	(84)m =	= (73)m	+ (83)	m , watts		•		•	•	•	
(84)m= 471.25	539.55 6	609.17	686.46	743.33	737.	33 704.36	651	.03 589.72	517.29	464.64	448.1		(84)
7. Mean inter	nal temper	ature	(heating	season)								
Temperature	during hea	ating p	eriods ir	أنيال مطاهم	<i>'</i>								
Utilisation fac	tor for goir	3 1	ciioas ii	i the livi	ng ar	ea from Tal	ble 9	, Th1 (°C)				21	(85)
	ioi ioi gaii	• .			•		ble 9	, Th1 (°C)				21	(85)
Jan	Feb	• .			•	Table 9a)		, Th1 (°C)	Oct	Nov	Dec	21	(85)
(86)m= 0.95	<u>_</u> _	ns for li	iving are	ea, h1,m	(see	Table 9a) n Jul		ug Sep	Oct 0.86	Nov 0.93	Dec 0.96	21	(85)
(86)m= 0.95	Feb 0.93	Mar 0.9	Apr 0.83	ea, h1,m May 0.72	Ju 0.5	Table 9a) n Jul 3 0.46	0.5	ug Sep 5 0.7	-	+		21	
	Feb 0.93	Mar 0.9	Apr 0.83	ea, h1,m May 0.72	Ju 0.5	Table 9a) n Jul 3 0.46 steps 3 to 7	0.5	ug Sep 5 0.7 Table 9c)	-	0.93		21	
(86)m= 0.95 Mean interna (87)m= 18.45	Feb 0.93 temperatu 18.73	Mar 0.9 ure in I	Apr 0.83 iving are	ea, h1,m May 0.72 ea T1 (fo	Ju 0.5	Table 9a) n Jul 3 0.46 steps 3 to 7	A: 0.:	ug Sep 5 0.7 Table 9c) 87 20.57	0.86	0.93	0.96	21	(86)
(86)m= 0.95 Mean interna (87)m= 18.45 Temperature	Feb 0.93 I temperatu 18.73 during hea	Mar 0.9 ure in I 19.21	Apr 0.83 iving are 19.83 eriods ir	ea, h1,m May 0.72 ea T1 (for 20.37) rest of	Ju 0.5	Table 9a) n Jul 3 0.46 steps 3 to 2 4 20.9 20.9 ing from Ta	A 0.47 in T 20.	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C)	0.86	0.93	0.96	21	(86)
(86)m= 0.95 Mean internal (87)m= 18.45 Temperature (88)m= 19.82	Feb 0.93 I temperatu 18.73 during hea 19.82	Mar 0.9 ure in I 19.21 ating per 19.82	Apr 0.83 iving are 19.83 eriods ir	ea, h1,m May 0.72 ea T1 (for 20.37 rest of 19.84	0.50 ollow 20.7 dwell 19.8	Table 9a) n Jul 3 0.46 steps 3 to 74 20.9 ing from Ta 5 19.85	A 0.47 in T 20.	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C)	0.86	0.93	0.96	21	(86)
Mean interna (87)m= 18.45 Temperature (88)m= 19.82 Utilisation fac	Feb 0.93 temperate 18.73 during hea 19.82 tor for gair	Mar 0.9 ure in I 19.21 ating points for residue.	Apr 0.83 iving are 19.83 eriods in 19.83 est of de	ea, h1,m May 0.72 ea T1 (for 20.37 n rest of 19.84 welling,	ollow 20.7 dwell 19.8	Table 9a) n Jul 3 0.46 steps 3 to 7 20.9 ing from Ta 19.85 (see Table	A 0.9 20. able 9 19.	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84	0.86 19.88 19.84	0.93 19.06	0.96 18.4 19.83	21	(86) (87) (88)
(86)m= 0.95 Mean interna (87)m= 18.45 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.94	Feb 0.93 I temperate 18.73 during hea 19.82 tor for gair 0.92	Mar 0.9 ure in 19.21 ating per 19.82 ns for r 0.88 19.88	Apr 0.83 iving are 19.83 eriods ir 19.83 eest of do 0.8	ea, h1,m May 0.72 ea T1 (for 20.37 n rest of 19.84 welling, 0.67	Ju 0.5 Ollow 20.7 dwell 19.8 h2,m 0.5	Table 9a) n Jul 3 0.46 steps 3 to 7 4 20.9 ing from Ta 5 19.85 (see Table 1 0.36	Ain T 20. able 9 19. 9a)	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84 4 0.63	0.86 19.88 19.84	0.93	0.96	21	(86)
Mean internal (87)m= 18.45 Temperature (88)m= 19.82 Utilisation fact (89)m= 0.94 Mean internal	Feb 0.93 I temperatu 18.73 during hea 19.82 tor for gair 0.92 I temperatu	Mar 0.9 ure in I 19.21 ating per 19.82 ns for r 0.88 ure in t	Apr 0.83 iving are 19.83 eriods ir 19.83 est of do 0.8	ea, h1,m May 0.72 ea T1 (for 20.37 rest of 19.84 welling, 0.67 of dwell	Ju 0.5 Ollow 20.7 dwell 19.8 h2,m 0.5 ling T2	Table 9a) n Jul 3 0.46 steps 3 to 74 20.9 ing from Ta 5 19.85 (see Table 1 0.36 2 (follow steps 3)	A 0.97 in T 20.03 able 9 19.03 9a) 0.03 abps 3	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84 4 0.63 6 to 7 in Table	0.86 19.88 19.84 0.83 e 9c)	0.93 19.06 19.83	0.96 18.4 19.83	21	(86) (87) (88) (89)
(86)m= 0.95 Mean interna (87)m= 18.45 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.94	Feb 0.93 I temperatu 18.73 during hea 19.82 tor for gair 0.92 I temperatu	Mar 0.9 ure in 19.21 ating per 19.82 ns for r 0.88 19.88	Apr 0.83 iving are 19.83 eriods ir 19.83 eest of do 0.8	ea, h1,m May 0.72 ea T1 (for 20.37 n rest of 19.84 welling, 0.67	Ju 0.5 Ollow 20.7 dwell 19.8 h2,m 0.5	Table 9a) n Jul 3 0.46 steps 3 to 74 20.9 ing from Ta 5 19.85 (see Table 1 0.36 2 (follow steps 3)	Ain T 20. able 9 19. 9a)	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84 4 0.63 6 to 7 in Table 76 19.44	0.86 19.88 19.84 0.83 e 9c) 18.52	0.93 19.06 19.83 0.92	0.96 18.4 19.83 0.95		(86) (87) (88) (89)
Mean internal (87)m= 18.45 Temperature (88)m= 19.82 Utilisation fact (89)m= 0.94 Mean internal	Feb 0.93 I temperatu 18.73 during hea 19.82 tor for gair 0.92 I temperatu	Mar 0.9 ure in I 19.21 ating per 19.82 ns for r 0.88 ure in t	Apr 0.83 iving are 19.83 eriods ir 19.83 est of do 0.8	ea, h1,m May 0.72 ea T1 (for 20.37 rest of 19.84 welling, 0.67 of dwell	Ju 0.5 Ollow 20.7 dwell 19.8 h2,m 0.5 ling T2	Table 9a) n Jul 3 0.46 steps 3 to 74 20.9 ing from Ta 5 19.85 (see Table 1 0.36 2 (follow steps 3)	A 0.97 in T 20.03 able 9 19.03 9a) 0.03 abps 3	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84 4 0.63 6 to 7 in Table 76 19.44	0.86 19.88 19.84 0.83 e 9c) 18.52	0.93 19.06 19.83	0.96 18.4 19.83 0.95	0.55	(86) (87) (88) (89)
Mean internal (87)m= 18.45 Temperature (88)m= 19.82 Utilisation fact (89)m= 0.94 Mean internal	Feb 0.93 I temperate 18.73 during hea 19.82 tor for gair 0.92 I temperate 16.87	ms for li Mar 0.9 ure in l 19.21 ating po 19.82 ns for r 0.88 ure in t	Apr 0.83 iving are 19.83 eriods ir 19.83 est of do 0.8 the rest	ea, h1,m May 0.72 ea T1 (for 20.37 n rest of 19.84 welling, 0.67 of dwell 19.15	(see Ju 0.5	Table 9a) n Jul 3 0.46 steps 3 to 7 4 20.9 ing from Ta 5 19.85 (see Table 1 0.36 2 (follow steps 2 19.78	A 0.97 in T 20.00 able 9 19.00 0.00 19.00	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84 4 0.63 6 to 7 in Table 76 19.44	0.86 19.88 19.84 0.83 e 9c) 18.52	0.93 19.06 19.83 0.92	0.96 18.4 19.83 0.95		(86) (87) (88) (89)
Mean interna (87)m= 18.45 Temperature (88)m= 19.82 Utilisation fact (89)m= 0.94 Mean interna (90)m= 16.46	Feb 0.93 I temperature 19.82 tor for gaire 0.92 I temperature 16.87	ms for li Mar 0.9 ure in l 19.21 ating po 19.82 ns for r 0.88 ure in t	Apr 0.83 iving are 19.83 eriods ir 19.83 est of do 0.8 the rest	ea, h1,m May 0.72 ea T1 (for 20.37 n rest of 19.84 welling, 0.67 of dwell 19.15	(see Ju 0.5	Table 9a) n Jul 3 0.46 steps 3 to 7 4 20.9 ing from Ta 5 19.85 (see Table 1 0.36 2 (follow steps 2 19.78) = fLA × T1	A 0.97 in T 20.00 able 9 19.00 0.00 19.00	ug Sep 5 0.7 Table 9c) 87 20.57 9, Th2 (°C) 85 19.84 4 0.63 6 to 7 in Table 76 19.44	0.86 19.88 19.84 0.83 e 9c) 18.52	0.93 19.06 19.83 0.92 17.35 ring area ÷ (4	0.96 18.4 19.83 0.95		(86) (87) (88) (89)

												•	
(93)m= 17.56	17.9	18.47	19.2	19.83	20.24	20.4	20.37	20.07	19.27	18.3	17.5		(93)
8. Space hea													
Set Ti to the i 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 fac	l	l	· ·		<u> </u>								
(94)m= 0.92	0.9	0.86	0.78	0.67	0.53	0.41	0.45	0.64	0.81	0.9	0.93		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	•								
(95)m= 435.2	484.78	521.63	536.71	500.7	394.63	287.38	293.32	379.26	421.08	417.18	416.94		(95)
Monthly average	age exte	T T		from T	able 8	·				·		ı	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate					i	- ` 	- ` 	- 			=	1	(07)
` ′	ļ	1009.67	859.73	676.69	464.87	313.16	326.79	493.73	722.31	936.97	1117.33		(97)
Space heatin (98)m= 512.06	g require 412.75	363.1	232.57	130.94	/vn/mon	$\ln = 0.02$	24 X [(97))m – (95 0)MJ X (4 224.12	1)m 374.25	521.09		
(98)111= 312.00	412.73	303.1	232.37	130.94		0				l .	<u> </u>	2770.86	(98)
				.,			TUld	l per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡``
Space heatin	g requir	ement in	kVVh/m²	/year								43.43	(99)
9b. Energy red	•		The state of the s	Ĭ									
This part is use Fraction of spa										unity sch	neme.	0	(301)
·			•		-	_	(Table T	1) 0 11 11	OHE				╡`
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so includes boilers, h									up to four	other heat	sources; ti	he latter	
Fraction of hea		-			rom power	stations.	ове Арреі	idix C.				1	(303a)
Fraction of total			•		oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	g										!	kWh/yea	 r
Annual space	_	requiren	nent									2770.86	
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	2909.41	(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	7												
Annual water h		equirem	ent									2082.35	
If DHW from c													<u> </u>
Water heat fro		•								5) x (306) :		2186.46	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)((310e)] =	50.96	(313)
Cooling Syster	_	•	•									0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p							اللاعديد				I		7(000.)
mechanical ve	ntilation	- paland	ea, extr	act or po	sitive in	put trom	outside					123.76	(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) =		123.76	(331)
Energy for lighting (calculated in Appen	dix L)				287.21	(332)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy	Emission fac	tor E	missions	
		kWh/year	kg CO2/kWh	kç	g CO2/year	
CO2 from other sources of space and w	ũ (,				_
Efficiency of heat source 1 (%)	If there is CHP us	ing two fuels repeat (363) to	(366) for the secon	id fuel	89.5	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	1229.84	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	26.45	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	2)	=	1256.29	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1256.29	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	64.23	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	149.06	(379)
Total CO2, kg/year	sum of (376)(382) =				1469.58	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				23.03	(384)

El rating (section 14)

(385)

81.9

			User D	otoile:						
	\". " T		USEI L					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 201	2		Strom: Softwa					018096 on: 1.0.5.12	
Software Name.	Ottoma i OAI 201		operty ,	Address				VCISIC	71. 1.0.5.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	7(0-)	Volume(m ³	<u>-</u>
	\ (41\) (4\) (4\) (4\)	\			(1a) x	2	.65	(2a) =	169.07	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)) [63.8	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	169.07	(5)
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır
N. sala and A. Parana	heating h	neating	, –		, –			40		_
Number of chimneys	0 +	0]	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] + L	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	2	X '	10 =	20	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	(a)+(6b)+(7a	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.12	(0)
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber resent, use the value corres				•	ruction			0	(11)
deducting areas of openi		sponding to	ırıe great	er wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.1	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 s	tripped							0	(14)
Window infiltration				0.25 - [0.2		_			0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil						is heina u	sad		0.37	(18)
Number of sides sheltere		s been done	or a acg	gree an per	meability	is being u	3CU		2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.31	(21)
Infiltration rate modified f	or monthly wind speed	t								
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									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
` '						L			J	

djusted infilti	ed infiltration rate (allowing for shelter and wind speed) = $(21a) \times (22a)m$ $\begin{bmatrix} 0.4 & 0.39 & 0.38 & 0.34 & 0.34 & 0.3 & 0.3 & 0.29 & 0.31 & 0.34 & 0.35 & 0.37 \end{bmatrix}$ ate effective air change rate for the applicable case												
_	1	1					0.29	0.31	0.34	0.35	0.37]	
<i>Calculate effe</i> If mechanic		•	rate for t	he appli	cable ca	se							(2:
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) . othe	rwise (23b) = (23a)			0	(2:
If balanced wit									, , ,			0	(2:
a) If balance	ed mech:	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22	2b)m + (23b) x ['	1 – (23c)		(2)
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	ed mech	anical ve	entilation	without	heat red	overy (N	MV) (24b	o)m = (22	<u>2</u> b)m + (2	 23b)	<u>!</u>	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h	nouse ex m < 0.5 ×			•	•				5 × (23b))	•		
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)r	ventilation $n = 1$, the								0.5]		!	1	
24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(24
Effective air	change	rate - er	nter (24a	or (24k	o) or (24	c) or (24	d) in box	x (25)				-	
25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(2
3. Heat losse	es and he	at Inss i	naramet	⊃r·									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-		A X k kJ/K
Vindows Type	e 1				3.1	x1	/[1/(1.4)+	0.04] =	4.11				(2
Vindows Type	e 2				6.66	x1	/[1/(1.4)+	0.04] =	8.83				(2
Valls Type1	81.0	6	15.9	6	65.64	x	0.18		11.82			$\neg \vdash$	(2
Valls Type2	15.0	6	0		15.6	x	0.18	_ = [2.81			$\neg \vdash$	(2
Roof	63.8	8	0		63.8	x	0.13	=	8.29			\exists \sqsubset	(3
otal area of	elements	, m²			161							<u> </u>	(3
for windows and * include the are						ated using	g formula 1	/[(1/U-valu	re)+0.04] a	ns given in	paragraph	1 3.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				44.08	(3
leat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	574.2	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(3
or design asses				construct	ion are no	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
an be used inste hermal bridg				ısina Ar	nendix k	(9.05	(3
details of therm	•	,		Ο.	•	`						8.05	(3
otal fabric he			()	. (-	,			(33) +	(36) =			52.13	(3
entilation he	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))	•	
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan		- 00	31.2	31.06	30.36	30.36	30.24	30.63	31.06	31.36	31.67]	(3
	32.17	32	"		1								
	<u> </u>				Į.			(39)m	= (37) + (37)	 38)m	!	-	
32.34	<u> </u>		83.33	83.18	82.49	82.49	82.36	(39)m 82.76	= (37) + (3 83.18	38)m 83.48	83.8	1	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.32	1.32	1.32	1.31	1.3	1.29	1.29	1.29	1.3	1.3	1.31	1.31		
	1			ı		ı	ı		Average =	Sum(40) ₁ .	12 /12=	1.31	(40)
Number of da	`	nth (Tab	le 1a)		ı			1	1	i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occ 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.		09		(42)
Annual average Reduce the annual not more that 125	ial 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 water usage													
(44)m= 92.14	88.79	85.44	82.09	78.74	75.39	75.39	78.74	82.09	85.44	88.79	92.14		
_						_				m(44) ₁₁₂ =	L	1005.13	(44)
Energy content o							OTm / 3600				· ·		
(45)m= 136.64	119.5	123.32	107.51	103.16	89.02	82.49	94.66	95.79	111.63	121.85	132.33		— ,,_,
If instantaneous	water heati	ina at point	of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	•	1317.89	(45)
(46)m= 20.5	17.93	18.5	16.13	15.47	13.35	12.37	14.2	14.37	16.74	18.28	19.85		(46)
Water storage	1	10.0	10.10	10.47	10.00	12.01	17.2	14.07	10.74	10.20	10.00		(12)
Storage volun	ne (litres) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community	heating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		aclarad l	nee fact	nr ie kna	wn (k\//k	J(day).					05		(48)
Temperature				JI IS KIIO	wii (Kvvi	i/uay).					65 54		(49)
Energy lost from				ar ar			(48) x (49)) -			89		(50)
b) If manufac		•			or is not		(10) X (10)	, –		0.	09		(50)
Hot water stor	-			le 2 (kW	h/litre/da	ay)					0		(51)
If community Volume factor	_		on 4.3										(==)
Temperature			2h							—	0		(52) (53)
Energy lost from				aar			(47) x (51)) x (52) x (53) -				(54)
Enter (50) or		_	, KVVII/ y (Jai			(41) X (01)) X (02) X (00) =	-	0 89		(55)
Water storage	` , ` `	,	or each	month			((56)m = ((55) × (41)	m				, ,
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contain												хH	` '
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circui	t loss (ar	nnual) fro	m Table	3	<u> </u>	!	!				0		(58)
Primary circui	•	•			59)m = ((58) ÷ 36	65 × (41)	ım			-		\ - <i>/</i>
(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)

Ohilana	lavdata d	.		(04)	(00) - 0	OF (44)	\						
Combi loss ca	liculated 0	for each	montn ((61)m =	(60) ÷ 30	05 × (41))m 0	T 0	0	Ιο	0	1	(61)
											<u> </u>] · (59)m + (61)m	(01)
(62)m= 187.56	165.5	174.24	156.79	154.09	138.3	133.41	145.58		162.56	171.14	183.25	(59)III + (61)III]	(62)
Solar DHW input	L	<u> </u>	<u> </u>	<u> </u>]	(02)
(add additiona									i contribu	lion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from w	ater hea	ter		<u>I</u>			l .	Į.				J	
(64)m= 187.56	165.5	174.24	156.79	154.09	138.3	133.41	145.58	145.07	162.56	171.14	183.25]	
		ļ	ļ.	Į	<u> </u>	<u>!</u>	Ou	tput from w	ater heate	r (annual)₁	l12	1917.5	(64)
Heat gains fro	m 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= 86.17	76.53	81.74	75.17	75.04	69.03	68.17	72.21	71.28	77.86	79.94	84.74	1	(65)
include (57)	m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):	-								
Metabolic gair	ns (Table	5), Wat	ts	,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-		_	
(67)m= 16.26	14.44	11.75	8.89	6.65	5.61	6.06	7.88	10.58	13.43	15.68	16.71]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5		-	_	
(68)m= 182.42	184.31	179.54	169.39	156.57	144.52	136.47	134.58	139.35	149.5	162.32	174.37		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also s	see Table	5	-	-	_	
(69)m= 33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43]	(69)
Pumps and fa	ns gains	(Table 5	ōa)									_	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47		(71)
Water heating	gains (T	able 5)										_	
(72)m= 115.82	113.89	109.87	104.41	100.86	95.87	91.62	97.06	98.99	104.65	111.03	113.9]	(72)
Total internal	gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 371.81	369.95	358.46	339.99	321.38	303.3	291.46	296.82	306.22	324.89	346.34	362.28		(73)
6. Solar gain													
Solar gains are		•				•	itions to c		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Northeast _{0.9x}							. —				_		7,75
Northeast 0.9x	0.77	X	3.	==		1.28	X	0.63	×	0.7	=	32.07	(75)
Northeast 0.9x	0.77	X	3.			22.97]	0.63		0.7	=	65.28	(75)
Northeast 0.9x	0.77	X	3.			11.38		0.63		0.7	=	117.61	(75)
Northeast 0.9x	0.77	X	3.		<u> </u>	37.96		0.63		0.7	_ =	193.14	(75)
Morniegol ().9x	0.77	X	3.	1	x g	91.35	X	0.63	x	0.7	=	259.62	(75)

F					-					_				_
Northeast _{0.9x}	0.77	X	3.	1	x	9	7.38	X	0.63	X	0.7	=	276.79	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	9	1.1	X	0.63	X	0.7	=	258.93	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	72	2.63	X	0.63	X	0.7	=	206.42	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	50	0.42	x	0.63	X	0.7	=	143.31	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	28	8.07	x	0.63	x	0.7	=	79.77	(75)
Northeast _{0.9x}	0.77	x	3.	1	x	1	4.2	x	0.63	X	0.7	=	40.35	(75)
Northeast _{0.9x}	0.77	x	3.	1	x	9).21	x	0.63	X	0.7	=	26.19	(75)
Southeast _{0.9x}	0.77	x	6.6	66	x	3(6.79	x	0.63	X	0.7	=	74.89	(77)
Southeast _{0.9x}	0.77	x	6.6	66	x	62	2.67	x	0.63	X	0.7	=	127.56	(77)
Southeast 0.9x	0.77	x	6.6	66	x	8	5.75	x	0.63	X	0.7	=	174.54	(77)
Southeast _{0.9x}	0.77	x	6.6	66	x	10	06.25	x	0.63	x	0.7	_	216.26	(77)
Southeast _{0.9x}	0.77	x	6.6	66	x	11	9.01	x	0.63	x	0.7	_	242.23	(77)
Southeast _{0.9x}	0.77	x	6.6	66	x	11	8.15	x	0.63	x	0.7	=	240.48	(77)
Southeast _{0.9x}	0.77	x	6.6	66	x	11	3.91	x	0.63	×	0.7		231.85	(77)
Southeast 0.9x	0.77	x	6.6	66	x	10)4.39	x	0.63	x	0.7	-	212.47	(77)
Southeast 0.9x	0.77	×	6.6	66	x	92	2.85	x	0.63	x	0.7	-	188.99	(77)
Southeast 0.9x	0.77	x	6.6	66	x	69	9.27	x	0.63	x	0.7		140.99	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	4	4.07	x	0.63	x	0.7	=	89.7	(77)
Southeast 0.9x	0.77	×	6.6	66	x	3	1.49	x	0.63	x	0.7	-	64.09	(77)
Solar gains in (83) m= 106.96 Total gains – i (84) m= 478.76	192.84 29	92.15	409.41	501.86	51 + (8	17.27 33)m ,	490.78	(83)m 418 715		220.70		90.28		(83)
7. Mean inter					•			713	.72 638.52	545.6	476.39	452.56		(84)
	nal tempera	ature (heating	season)			7 13	.72 638.52	545.6	4/6.39	452.56		(84)
Temperature						area f	rom Tab			545.65	6 476.39	452.56	21	(84)
Temperature Utilisation fac	during hea	ting pe	eriods ir	n the livi	ng a					545.69	6 476.39	452.56	21	
•	during hea	ting pe	eriods ir	n the livi	ng a			ole 9,		0ct		452.56 Dec	21	
Utilisation fac	during hea ctor for gain Feb	ting pe	eriods ir ving are	the livi a, h1,m	ng a	ee Tal	ble 9a)	ole 9,	Th1 (°C)				21	
Utilisation fac	during hea ctor for gain Feb	ting posting posting the state of the state	eriods ir ving are Apr 0.92	n the livi ea, h1,m May 0.79	ng a	ee Tal Jun).61	Jul 0.46	ole 9, Ai	Th1 (°C) ug Sep 2 0.77	Oct	Nov	Dec	21	(85)
Utilisation fac Jan (86)m= 0.99	during hea ctor for gain Feb 0.99 (ting posting posting the state of the state	eriods ir ving are Apr 0.92	n the livi ea, h1,m May 0.79	ng a	ee Tal Jun).61	Jul 0.46	ole 9, Ai	Th1 (°C) ug Sep 2 0.77 able 9c)	Oct	Nov	Dec	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean internation (87)m= 19.67	during hea ctor for gain Feb 0.99 (Itemperatu	s for li Mar 0.97 ure in l	eriods ir ving are Apr 0.92 iving are 20.54	n the livi ea, h1,m May 0.79 ea T1 (fo	ng and (see	Jun 0.61 w ster	Jul 0.46 os 3 to 7 20.99	0.5 ' in T	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89	Oct 0.95	Nov 0.99	Dec 1	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean internal	during hea etor for gain Feb 0.99 (Il temperatu 19.86 2 during hea	s for li Mar 0.97 ure in l	eriods ir ving are Apr 0.92 iving are 20.54	n the livi ea, h1,m May 0.79 ea T1 (fo	ng an (se	Jun 0.61 w ster	Jul 0.46 os 3 to 7 20.99	0.5 ' in T	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C)	Oct 0.95	Nov 0.99 20.01	Dec 1	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean internal (87)m= 19.67 Temperature (88)m= 19.82	during head ctor for gain Feb 0.99 (ctor) I temperature 19.86 2 during head 19.82 1	s for li Mar 0.97 ure in l 0.16 ting po	eriods ir ving are Apr 0.92 iving are 20.54 eriods ir	n the livi ea, h1,m May 0.79 ea T1 (fo 20.83 n rest of 19.84	ng a sold (See See See See See See See See See Se	Jun 0.61 w step 0.96 elling 9.85	Jul 0.46 os 3 to 7 20.99 from Ta 19.85	At 0.57 in T 20.50 ble 9	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C)	Oct 0.95	Nov 0.99 20.01	Dec 1 1 19.63	21	(85) (86) (87)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors	during head ctor for gain Feb 0.99 (classification of the content of the ctor for gain	s for li Mar 0.97 ure in l 20.16 ting po 9.83	eriods ir ving are Apr 0.92 iving are 20.54 eriods ir 19.84 est of d	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling,	ng a ling (see	Jun 0.61 w ster 0.96 elling 9.85 m (se	Jul 0.46 os 3 to 7 20.99 from Ta 19.85 e Table	At 0.57 in T 20.50 ble 9	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 9, Th2 (°C) 85 19.84	Oct 0.95 20.5	Nov 0.99 20.01	Dec 1 19.63	21	(85) (86) (87)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.99	during head ctor for gain Feb 0.99 (ctor) I temperature 19.86 2 during head 19.82 1 ctor for gain 0.99 (ctor)	s for li Mar 0.97 ure in l 20.16 ting pe 9.83 s for r 0.96	eriods ir ving are Apr 0.92 iving are 20.54 eriods ir 19.84 est of do	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling, 0.73	ng a (se	Jun 0.61 w ster 0.96 elling 9.85 m (se	Jul 0.46 os 3 to 7 20.99 from Ta 19.85 e Table 0.34	Al 0.52 in T 20.0 lble 9 19.0	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C) 85 19.84	Oct 0.95 20.5 19.84 0.93	Nov 0.99 20.01	Dec 1 1 19.63	21	(85) (86) (87) (88)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.99 Mean internation factors (89)m= 0.99	during hear ctor for gain Feb 0.99 0 temperatu 19.86 2 during hear 19.82 1 temperatu 0.99 0 temperatu	s for li Mar 0.97 ure in l 0.16 ting pe 9.83 s for r 0.96 ure in t	eriods ir ving are Apr 0.92 iving are 20.54 eriods ir 19.84 est of do 0.89 he rest	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling, 0.73 of dwell	ng a (see of other see of other	Jun 0.61 w step 0.96 elling 9.85 m (se 0.51 T2 (fc	Jul 0.46 0.8 3 to 7 20.99 from Ta 19.85 e Table 0.34 bllow ste	All 0.55 All 0.55 All 19.0 All	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C) 85 19.84 19 0.68 to 7 in Table	Oct 0.95 20.5 19.84 0.93 e 9c)	Nov 0.99 20.01 19.83	Dec 1 19.63 19.83	21	(85) (86) (87) (88) (89)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.99	during hear ctor for gain Feb 0.99 0 temperatu 19.86 2 during hear 19.82 1 temperatu 0.99 0 temperatu	s for li Mar 0.97 ure in l 20.16 ting pe 9.83 s for r 0.96	eriods ir ving are Apr 0.92 iving are 20.54 eriods ir 19.84 est of do	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling, 0.73	ng a (see of other see of other	Jun 0.61 w ster 0.96 elling 9.85 m (se	Jul 0.46 os 3 to 7 20.99 from Ta 19.85 e Table 0.34	Al 0.52 in T 20.0 lble 9 19.0	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C) 85 19.84 19 0.68 to 7 in Table 84 19.76	Oct 0.95 20.5 19.84 0.93 e 9c) 19.29	Nov 0.99 20.01 19.83 0.99	Dec 1 19.63 19.83 0.99		(85) (86) (87) (88) (89) (90)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.99 Mean internation (90)m= 18.08	during head ctor for gain Feb 0.99 (ctor) I temperature 19.86 2 (ctor) during head 19.82 1 (ctor) ctor for gain 0.99 (ctor) I temperature 18.35 1	s for li Mar 0.97 ure in l 0.16 ting po 9.83 s for r 0.96 ure in t 8.79	eriods ir ving are Apr 0.92 iving are 20.54 eriods ir 19.84 est of do 0.89 he rest 19.32	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling, 0.73 of dwell 19.68	ng a (see of open see of open	w ster 0.96 elling 9.85 m (se 0.51 T2 (fo	Jul 0.46 0.8 3 to 7 20.99 from Ta 19.85 e Table 0.34 ollow ste 19.84	All 0.5 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19.0	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C) 85 19.84 19 0.68 to 7 in Table 19.76	Oct 0.95 20.5 19.84 0.93 e 9c) 19.29	Nov 0.99 20.01 19.83	Dec 1 19.63 19.83 0.99	0.55	(85) (86) (87) (88) (89)
Utilisation factors Jan (86)m= 0.99 Mean internal (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.99 Mean internal (90)m= 18.08	during hear ctor for gain Feb 0.99 0 temperatu 19.86 2 during hear 19.82 1 temperatu 0.99 0 temperatu 18.35 1 temperatu 18.35	s for li Mar 0.97 ure in l 0.16 ting po 9.83 s for r 0.96 ure in t 8.79 ure (for	eriods in ving are Apr 0.92 iving are 20.54 eriods in 19.84 est of dr 0.89 he rest 19.32	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling, 0.73 of dwell 19.68	ng a (see of see	Dee Tal Jun 0.61 w ster 0.96 elling 9.85 m (se 0.51 T2 (fc 9.82	Jul 0.46 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34	All 0.55 ' in T 20.3 ble 9, 19.0 0.3 19.0 + (1	Th1 (°C) ug Sep 2 0.77 fable 9c) 99 20.89 0, Th2 (°C) 85 19.84 19 0.68 to 7 in Table 84 19.76	Oct 0.95 20.5 19.84 0.93 e 9c) 19.29	Nov 0.99 20.01 19.83 0.99 18.59 ring area ÷ (-	Dec 1 19.63 19.83 0.99 18.03 4) =		(85) (86) (87) (88) (89) (90) (91)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.67 Temperature (88)m= 19.82 Utilisation factors (89)m= 0.99 Mean internation (90)m= 18.08	during head ctor for gain Feb 0.99 (1) temperature 19.86 2 during head 19.82 1 deter for gain 0.99 (1) temperature 18.35 1 determinent 19.19 1 det	s for li Mar 0.97 ure in l 0.16 ting po 9.83 s for r 0.96 ure in t 8.79 ure (for 9.55	eriods in ving are Apr 0.92 iving are 20.54 eriods in 19.84 est of do 0.89 he rest 19.32 r the wh	n the livies, h1,m May 0.79 ea T1 (for 20.83 n rest of 19.84 welling, 0.73 of dwell 19.68 ole dwe 20.32	ng a (see of see	ee Tal Jun 0.61 w step 0.96 elling 9.85 m (se 0.51 T2 (fc 9.82 g) = fL 0.45	Jul 0.46 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34	All 0.5 ' in T 20.9 19.0 9a) 0.3 19.0 + (1 20.0	Th1 (°C) ug Sep 2 0.77 able 9c) 99 20.89 0, Th2 (°C) 85 19.84 19 0.68 to 7 in Table 84 19.76 f	Oct 0.95 20.5 19.84 0.93 e 9c) 19.29 LA = Liv	Nov 0.99 20.01 19.83 0.99 18.59 ring area ÷ (-	Dec 1 19.63 19.83 0.99		(85) (86) (87) (88) (89) (90)

(20) 	40.00	10.10	10.55		00.00	00.45	00.40		00.00	10.00	10.00	40.00	l	(02)
` ′	18.96	19.19	19.55	20	20.32	20.45	20.48	20.48	20.39	19.96	19.38	18.92		(93)
			uirement		ro obtoin	ad at at	on 11 of	Table 0	h oo tho	tTim /	76\m an	d ro oolo	vuloto	
			or gains	•		eu ai sii	ep 11 01	Table 9	u, su ina	t 11,111=(rojili ali	d re-calc	uiale	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat	ı		ains, hm					,					ı	
(94)m=	0.99	0.98	0.96	0.89	0.76	0.57	0.41	0.46	0.73	0.93	0.98	0.99		(94)
	- 		, W = (94	<u> </u>				T	I			I I		(05)
` ′	474.65	552.9	624.11	670.02	624.78	464.44	316.93	330.16	464.69	508.08	468.4	449.48		(95)
(96)m=	y avera	age exte	rnal tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
											7.1	4.2		(90)
_		1204.36		924.88	716.82	482.92	320.11	335.78	- (96)m	778.84	1025.2	1233.42		(97)
` ′	l		l)m – (95		<u> </u>	1200.42		(01)
· -	568.06	437.79	352.51	183.49	68.48	0	0.02	0	0	201.44	400.89	583.25		
(00)					-				l per year	(kWh/vear	<u> </u>	<u> </u>	2795.91	(98)
Canan	ا مائده ما			1.\ \	2/1004				po. you.	(,) ca.	<i>)</i> • • • • • • • • • • • • • • • • • • •	C)10,512		╡``
	`	•	ement in										43.82	(99)
1			nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space		•			/I-							ı	_	٦,,,,,,
	•		at from se			mentary	•		(224)				0	(201)
Fractio	n of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fractio	n of tot	al heatii	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficier	ncy of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficier	ncy of s	econda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
	- i	•	ement (c		i i		ı				1		ı	
L	568.06	437.79	352.51	183.49	68.48	0	0	0	0	201.44	400.89	583.25		
(211)m :	= {[(98)	m x (20	4)] } x 1	00 ÷ (20)6)		•				•			(211)
L	607.55	468.22	377.01	196.25	73.24	0	0	0	0	215.45	428.76	623.8		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u>F</u>	2990.28	(211)
•	7	•	econdar	• •	month									
			00 ÷ (20		_			<u> </u>	I .	_		I		
(215)m=	0	0	0	0	0	0	0	0 	0	0	0	0		7
								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u></u>	0	(215)
Water h	_													
	rom wa 187.56	ater hea 165.5	ter (calc 174.24	ulated al 156.79	154.09	138.3	133.41	145.58	145.07	162.56	171.14	183.25		
L Efficiend				130.79	134.03	130.3	133.41	143.30	143.07	102.50	171.14	100.20	79.8	(216)
_	87.58	87.29	86.66	85.23	82.81	79.8	79.8	79.8	79.8	85.39	87.01	87.69	79.0	(217)
` ' L			kWh/mo		02.01	7 3.0	1 7 3.0	1 7 3.0	7 3.0	00.00	07.01	07.03		()
		•	(217) ÷ (
(219)m=		189.6	201.07	183.96	186.07	173.31	167.19	182.43	181.79	190.38	196.69	208.98		
_			•				•	Tota	I = Sum(2	19a) ₁₁₂ =	•	•	2275.62	(219)
Annual	totals									k'	Wh/year	•	kWh/year	<u>-</u>
Space h	neating	fuel use	ed, main	system	1								2990.28	╛
												•		_

					_
Water heating fuel used				2275.62	
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 (23	0a)(230g) =		75	(231)
Electricity for lighting				287.21	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	645.9	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	491.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =	:		1137.43	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	149.06	(268)
Total CO2, kg/year	su	ım of (265)(271) =		1325.42	(272)

TER =

(273)

20.77



APPENDIX B SAP REPORTS – "BE GREEN" STAGE

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:48

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.3m²

Plot Reference: Site Reference: **Tottenham Mews** 0_02 - 2B4P

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

27.01 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 12.30 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 48.0 kWh/m²

OK 2 Fabric U-values

Element Average

Highest External wall 0.19 (max. 0.30) 0.20 (max. 0.70) OK Floor 0.06 (max. 0.25) 0.06 (max. 0.70) OK

Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

OK

Regulations Compliance Report

Percentage of fixed lights with low energy fittings	100.0%	
Percentage of fixed lights with low-energy fittings Minimum	75.0%	Oł
lechanical ventilation	73.0%	Or
Continuous supply and extract system	0.40	
Specific fan power:	0.48	01
Maximum	1.5	OF
MVHR efficiency:	78%	01
Minimum	70%	Oł
summertime temperature		
Overheating risk (Thames valley):	Medium	Ok
ed on:		
Overshading:	Average or unknown	
Windows facing: North East	2.59m²	
Windows facing: North East	2.59m²	
Windows facing: North East	5m²	
Ventilation rate:	2.00	
Blinds/curtains:	Dark-coloured curtain or rolle	er blind
	Closed 100% of daylight hou	ırs
Key features		
Air permeablility	3.0 m ³ /m ² h	
Windows U-value	1.1 W/m²K	
Floors U-value	0.06 W/m²K	
Community heating, heat from electric heat pump	2.2.2	
Photovoltaic array		

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.5.12	
	F	Property	Address	: 0_02 -	2B4P				
Address: 1. Overall dwelling dime	oneione:								
1. Overall dwelling diffie	511310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Ground floor				(1a) x		2.65	(2a) =	226.05	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	85.3	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	226.05	(5)
2. Ventilation rate:									
	main seconda heating heating	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	╗╻	0	Ī = Ī	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x ²	10 =	0	(7a)
Number of passive vents	3			Ī	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_					
		_ 、	. _ \	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		, a to (_/ ,	00		o (o) to	(1.5)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	1.25 for steel or timber frame or resent, use the value corresponding to			•	ruction			0	(11)
deducting areas of openi		o irie grea	ter wall are	a (aner					
•	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	P x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15) (16)
	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) = ((16)				0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed		Г	
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (*	19)] =			0.7	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18					0.1	(21)
Infiltration rate modified f	•							<u> </u>	` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (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		
	• • •	-	-	-	-	-	-	•	

0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effec		-	rate for t	he appli	cable ca	se		ı	ı	ı		_	<u> </u>
If mechanical If exhaust air he			andiv N (2	3h) - (23a	a) v Emy (e	aguation (1	VSV) other	rwica (23h) = (232)			0.5	(2
If balanced with) = (23a)			0.5	(2
		-	-	_					2h\ (00h) [/	1 (00.0)	66.3	(2
a) If balance	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29) - 100]]	(2
b) If balance		l									0.23	J	(-
4b)m= 0	0		0	0	0	0	0	0	0	0	0	1	(2
c) If whole h												_	
if (22b)n				•	•				.5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft				J	
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	_	
5)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(
. Heat losse	c and he	nat loce r	aramata	or:								_	
	S and the Gros	•	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-valu	Δ	ΑΧk
LEMENT	area	_	m		A,r		W/m2		(W/I	K)	kJ/m².		kJ/K
indows Type	: 1				2.59	x1.	/[1/(1.1)+	0.04] =	2.73				(
indows Type	2				2.59	x1,	/[1/(1.1)+	0.04] =	2.73	Ħ			(
indows Type	3				5	x1	/[1/(1.1)+	0.04] =	5.27				(
oor					85.3	x	0.06	[5.118	=			(
alls Type1	35.	8	10.18	3	25.62		0.2	<u> </u>	5.12	=		-	`
alls Type2	45.		0			x				룩 ;			
otal area of e					45.1		0.19		8.35				
or windows and		•	offective wi	ndow I I-ve	166.2		r formula 1	/[/1/ ₋ val	(۱۸۵ مرامر	se aivon in	naragrani	h 3 2	(
include the area						atou using	i Torritula 1	/[(ic)+0.0+j c	is giveri iii	paragrapi	1 0.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				29.32	(
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	6397.5	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(
r design assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste						_							
ermal bridge	•	,			•	<						24.93	(
letails of therma Ital fabric he		are not kn	own (36) =	= <i>0.05 x (</i> 3	11)			(33) +	(36) =			54.05	(
entilation hea		alculator	l monthly	,					$= 0.33 \times ($	25\m v (5)	١	54.25	(
Jan	Feb	Mar			Jun	Jul	Aug	Sep	Oct	Nov	Ī _	1	
3)m= 22.56	22.36	22.16	Apr 21.18	May 20.99	20.01	20.01	19.81	20.4	20.99	21.38	21.77	1	(
· L		<u> </u>	21.10	20.33	20.01	20.01	13.01	<u> </u>	<u> </u>	<u> </u>	21.77	J	(
eat transfer o	coefficie	nt, W/K	1			1		· ` ′	= (37) + (37)		1	1	
9)m= 76.81	76.61	76.41	75.43	75.24	74.26	74.26	74.06	74.65	75.24	75.63	76.02		

Heat loss para	ameter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.9	0.9	0.9	0.88	0.88	0.87	0.87	0.87	0.88	0.88	0.89	0.89		
									Average =	Sum(40) ₁ .	12 /12=	0.88	(40)
Number of da	·	<u> </u>				l				T			
Jan 31	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)
4.144											1.3.50		
4. Water hea	iting ene	rgy requi	rement:								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		56		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		4.9		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage							_	1 - 3 5		L			
(44)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		
										m(44) ₁₁₂ =	L	1138.8	(44)
Energy content o	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1			
(45)m= 154.81	135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		_
If instantaneous v	vater heati	na at point	of use (no	o hot water	· storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	• [1493.14	(45)
(46)m= 23.22	20.31	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(46)
Water storage		20.00	10.27	17.00	10.10	14.02	10.00	10.20	10.07	20.71	22.40		(10)
Storage volun	ne (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If community I	heating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufac		eclared l	nss fartí	nr is kna	wn (k\//h	n/day).					24		(48)
Temperature				51 15 Ki10	WII (ICVVI	ı, aay).					.6		(49)
Energy lost from				ear			(48) x (49)) =			34		(50)
b) If manufac		•			or is not		(10)11(10)	,		1.	J4		(00)
Hot water stor	_			le 2 (kW	h/litre/da	ay)					0		(51)
If community I Volume factor	_		on 4.3										(50)
Temperature 1			2b							—	0		(52) (53)
Energy lost from				-ar			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,y	Jui			() ()	, (==, (,	-	34		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinder contain												хН	, ,
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circui	t loss for	nual) fra	m Table	3							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 loss calculat	ed for eacl	n month	(61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0	1	(61)
Total heat required	for water h	eating ca	alculated	l for eac	h month	(62)ı	<u>—</u> m =	0.85 × (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 219.73 194.		184.64	181.8	163.69	158.38	172		171.36	191.4	200.89	214.85]	(62)
Solar DHW input calcula	ed using Ap	pendix G o	r Appendix	H (negati	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	.	
(add additional lines	if FGHRS	and/or \	WWHRS	applies	, see Ap	pend	lix G	3)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water h	eater		•		•						•	•	
(64)m= 219.73 194.	204.64	184.64	181.8	163.69	158.38	172	.17	171.36	191.4	200.89	214.85]	
	•				•		Outp	ut from wa	ater heate	er (annual) ₁	12	2257.6	(64)
Heat gains from wa	er heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	((46)m	+ (57)m	+ (59)m	ı]	
(65)m= 103.41 91.9	3 98.4	90.77	90.8	83.8	83.02	87.	.6	86.35	93.99	96.17	101.79]	(65)
include (57)m in o	alculation	of (65)m	only if c	ylinder i	s in the	dwell	ing (or hot w	ater is f	rom com	munity h	- neating	
5. Internal gains (see Table	5 and 5a):										
Metabolic gains (Ta	ble 5), Wa	tts											
Jan Fe		Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 127.79 127.	79 127.79	127.79	127.79	127.79	127.79	127	.79	127.79	127.79	127.79	127.79]	(66)
Lighting gains (calc	ulated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5				-	
(67)m= 23.21 20.6	2 16.77	12.69	9.49	8.01	8.66	11.2	25	15.1	19.17	22.38	23.86]	(67)
Appliances gains (c	alculated i	n Append	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 230.16 232.	55 226.53	213.72	197.54	182.34	172.19	169	9.8	175.82	188.63	204.8	220.01]	(68)
Cooking gains (cald	ulated in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5		•	•	
(69)m= 35.78 35.7	8 35.78	35.78	35.78	35.78	35.78	35.	78	35.78	35.78	35.78	35.78]	(69)
Pumps and fans ga	ns (Table	5a)			•							•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evapora	ition (nega	itive valu	es) (Tab	le 5)	-							-	
(71)m= -102.23 -102.	23 -102.23	-102.23	-102.23	-102.23	-102.23	-102	.23	-102.23	-102.23	-102.23	-102.23]	(71)
Water heating gains	(Table 5)				•		•					•	
(72)m= 139 136.	132.25	126.06	122.05	116.39	111.58	117.	.74	119.93	126.34	133.57	136.81]	(72)
Total internal gain	S =		•	(66)m + (67)m	n + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	•	
(73)m= 453.71 451.	31 436.89	413.81	390.41	368.08	353.76	360	.13	372.19	395.48	422.09	442.01]	(73)
6. Solar gains:													
Solar gains are calcula	•	ar flux from	Table 6a	and assoc	ciated equa	tions 1	to co	nvert to th	e applica		tion.		
Orientation: Acces		Area		Flu			т.	g_ able 6b	т	FF		Gains	
Table		m²		Ta	ble 6a			able ob	_ '	able 6c		(W)	,
	54 ×	2.5	59	X	11.28	X		0.44	x	8.0	=	5	(75)
	54 ×	2.5	59	X ·	11.28	X		0.44	x	0.8	=	5	(75)
	54 ×		5	X ·	11.28	X		0.44	x	0.8	=	9.65	(75)
	54 ×	2.5	59	x	22.97	X		0.44	x	0.8	=	10.18	(75)
Northeast 0.9x	54 ×	2.5	59	x	22.97	X		0.44	X	0.8	=	10.18	(75)

Northeast 0 36								_						
Northeast 0.0x	<u> </u>	0.54	X	5	X	2	2.97	X	0.44	X	0.8	=	19.64	(75)
Northeast 0.9x	<u> </u>	0.54	X	2.59	X	4	1.38	X	0.44	X	0.8	=	18.33	(75)
Northeast 0.ax	Northeast _{0.9x}	0.54	X	2.59	X	4	1.38	X	0.44	X	0.8	=	18.33	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	5	X	4	1.38	X	0.44	X	0.8	=	35.39	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	6	7.96	X	0.44	X	0.8	=	30.11	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	6	7.96	X	0.44	X	0.8	=	30.11	(75)
Northeast 0.8x	Northeast 0.9x	0.54	X	5	X	6	7.96	X	0.44	X	0.8	=	58.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	9	1.35	X	0.44	X	0.8	=	40.47	(75)
Northeast 0.9% 0.54	Northeast _{0.9x}	0.54	X	2.59	X	9	1.35	X	0.44	X	0.8	=	40.47	(75)
Northeast 0.9x	Northeast 0.9x	0.54	X	5	X	9	1.35	X	0.44	X	0.8	=	78.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	9	7.38	X	0.44	X	0.8	=	43.15	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	X	9	7.38	X	0.44	X	0.8	=	43.15	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	5	X	9	7.38	X	0.44	X	0.8	=	83.3	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x		91.1	X	0.44	x	0.8	_ =	40.36	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x		91.1	X	0.44	x	0.8	=	40.36	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x		91.1	X	0.44	x	0.8	=	77.92	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	7	2.63	X	0.44	x	0.8	=	32.18	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	x	7	2.63	X	0.44	x	0.8	=	32.18	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x	7	2.63	j x	0.44	x	0.8	=	62.12	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	X	2.59	x	5	0.42	X	0.44	X	0.8	=	22.34	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	5	0.42	X	0.44	x	0.8	=	22.34	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x	5	0.42	X	0.44	x	0.8	=	43.13	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	х	2.59	x	2	28.07	X	0.44	x	0.8	=	12.44	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	2	28.07	X	0.44	x	0.8	=	12.44	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x	2	28.07	X	0.44	x	0.8	=	24.01	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x		14.2	X	0.44	x	0.8	=	6.29	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	х	2.59	x		14.2	X	0.44	x	0.8	=	6.29	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	5	x		14.2	X	0.44	x	0.8	=	12.14	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	2.59	x	,	9.21	X	0.44	x	0.8	=	4.08	(75)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 19.65	Northeast 0.9x	0.54	x	2.59	x	,	9.21	X	0.44	x	0.8	=	4.08	(75)
(83)m= 19.65 40 72.06 118.35 159.08 169.6 158.65 126.48 87.81 48.88 24.72 16.05 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Northeast _{0.9x}	0.54	x	5	x		9.21	j x	0.44	x	0.8	=	7.88	(75)
(83)m= 19.65 40 72.06 118.35 159.08 169.6 158.65 126.48 87.81 48.88 24.72 16.05 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_							_						
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in v	watts, cal	culated	for each m	onth			(83)m	n = Sum(74)m	(82)m			_	
(84)m= 473.35 491.3 508.95 532.16 549.5 537.67 512.41 486.61 459.99 444.36 446.81 458.06 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(83)m= 19.65	40	72.06	118.35 15	9.08	169.6	158.65	126	.48 87.81	48.88	3 24.72	16.05		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Total gains – ir	nternal ar	nd solar	(84)m = (73)	3)m + (83)m	, watts							
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 473.35	491.3	508.95	532.16 54	9.5	37.67	512.41	486	.61 459.99	444.3	6 446.81	458.06		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean interr	nal tempe	erature ((heating sea	ason)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during he	eating pe	eriods in the	e living	area	from Tal	ble 9	, Th1 (°C)				21	(85)
(86)m= 0.97 0.96 0.95 0.91 0.84 0.71 0.57 0.61 0.8 0.92 0.96 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation fact	tor for ga	ins for li	iving area, I	n1,m (s	ee Ta	ble 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Jan	Feb	Mar	Apr N	/lay	Jun	Jul	A	ug Sep	Oc	Nov	Dec		
	(86)m= 0.97	0.96	0.95	0.91 0.	84	0.71	0.57	0.6	0.8	0.92	0.96	0.97		(86)
	Mean internal	tempera	ture in I	iving area 1	1 (follo	ow ste	ps 3 to 7	7 in T	able 9c)					
			- 1		<u> </u>		i			20.13	3 19.56	19.09]	(87)
				•				•	•	•	•	-	•	

Tomp	oraturo	during h	neating p	oriode ir	roet of	dwelling	from Ta	ble 0 T	h2 (°C)					
(88)m=	20.17	20.17	20.17	20.18	20.18	20.19	20.19	20.19	20.19	20.18	20.18	20.17		(88)
. ,		ļ	ains for i						20.10	20.10	20.10	20.11		(,
(89)m=	0.97	0.96	0.94	0.9	0.81	0.65	0.49	0.53	0.75	0.9	0.95	0.97		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.61	17.82	18.27	18.92	19.53	19.97	20.13	20.11	19.82	19.1	18.27	17.58		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.49	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			•		_
(92)m=	18.34	18.52	18.9	19.45	19.98	20.37	20.52	20.5	20.23	19.6	18.9	18.31		(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.34	18.52	18.9	19.45	19.98	20.37	20.52	20.5	20.23	19.6	18.9	18.31		(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	
tilo di	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm		,		<u> </u>		<u>'</u>					
(94)m=	0.95	0.94	0.93	0.88	0.8	0.67	0.52	0.56	0.76	0.89	0.94	0.96		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	451.14	464.13	470.9	469.35	440.24	358.09	267.2	273.17	347.33	394.06	418.85	438.33		(95)
		r	rnal tem											(0.0)
(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)
(97)m=		1043.54	an intern 947.58	796.15	622.84	LM , VV =	=[(39)m : 290.91	x [(93)m 303.5	- (96)m 457.61	677.5	892.78	1073.05		(97)
,		l	ement fo									107 5.05		(01)
(98)m=	466.84	389.36	354.65	235.3	135.85	0	0	0	0	210.88	341.23	472.23		
` '			<u> </u>					I Tota	l I per year	(kWh/year) = Sum(9	8) _{15,912} =	2606.35	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year						,	, I	30.56	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme						L		
			ace hea		The state of the s			ing prov	rided by	a comm	unity sch	neme.		_
Fractio	n of spa	ace heat	from se	condary	supplen/	nentary I	neating (Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
	-		y obtain he s, geotherr							up to four o	other heat	sources; th	ne latter	
			Commun			,		,,					1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g										L	kWh/yea	
Annua	l space	heating	requirem	nent									2606.35	
Space	heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (305	5) x (306) =	= [2736.67	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308

					٦
Space heating requirement from secon	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2257.6	
If DHW from community scheme: Water heat from Community heat pump)	(64) x (303a) x	(305) x (306) =	2370.48	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	(e) + (310a)(310e)] =	51.07	
Cooling System Energy Efficiency Ratio	0			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	· ,	iide		165.46	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330l	b) + (330g) =	165.46	(331)
Energy for lighting (calculated in Appen	dix L)			409.9	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-647.15	(333)
Electricity generated by wind turbine (A	ppendix M) (negative quantit	y)		0	(334)
12b. CO2 Emissions - Community hear	ting scheme				
	- J	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)	vater heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year	(367a)
•	If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year](367a)
Efficiency of heat source 1 (%)	If there is CHP using two	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue	kg CO2/year 250 1060.24	_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using two [(307b)+(310t)	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.52 = 0.52 =	kg CO2/year 250 1060.24 26.51	367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP using two [(307b)+(310t) [(313 systems (363)	kWh/year fuels repeat (363) to ii)] x 100 ÷ (367b) x ii x (366) + (368)(372	kg CO2/kWh (366) for the second fue 0.52 = 0.52 =	kg CO2/year 250 1060.24 26.51 1086.75	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	If there is CHP using two [(307b)+(310t) [(313 systems (363) econdary) (309)	kWh/year fuels repeat (363) to i)] x 100 ÷ (367b) x i x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.52 = 0.52 =	kg CO2/year 250 1060.24 26.51 1086.75	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous	kWh/year fuels repeat (363) to i)] x 100 ÷ (367b) x i x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 =	kg CO2/year 250 1060.24 26.51 1086.75	(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 so CO2 associated with space heating (see	If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373)	fuels repeat (363) to o)] x 100 ÷ (367b) x ox (366) + (368)(372 x heater (312) x + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 =	250 250 1060.24 26.51 1086.75 0 1086.75	(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 so CO2 associated with space heating (see CO2 associated with water from immersorated CO2 associated with space and water s	If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling	fuels repeat (363) to fuels repeat (363) to $[x] \times 100 \div (367b) \times 100 $	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 250 1060.24 26.51 1086.75 0 1086.75 85.88	(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 so CO2 associated with space heating (see CO2 associated with water from immersorated to the control of the contro	If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332)	fuels repeat (363) to fuels repeat (363) to $[x] \times 100 \div (367b) \times 100 $	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 250 1060.24 26.51 1086.75 0 1086.75 85.88	(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 so CO2 associated with space heating (see CO2 associated with water from immersorated to the control of the contro	If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332)	fuels repeat (363) to fuels repeat (363) to $[x] \times 100 \div (367b) \times 100 $	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 250 1060.24 26.51 1086.75 0 1086.75 85.88 212.74	[(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 source 1 CO2 associated with space heating (see CO2 associated with water from immersorated CO2 associated with space and with co2 associated with space and with co2 associated with electricity for pum CO2 associated with electricity for lighting Energy saving/generation technologies litem 1	If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332) (333) to (334) as applicable	fuels repeat (363) to fuels repeat (363) to $[x] \times 100 \div (367b) \times 100 $	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 250 1060.24 26.51 1086.75 0 1086.75 85.88 212.74	(372) (373) (374) (375) (376) (378) (379)

		l Iser-I	Details:						
Assessor Name:	Vitaliy Troyan	USGI^L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	į	Property	Address	: 0_02 -	2B4P				
Address: 1. Overall dwelling dime	pnoiono:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	eight(m)		Volume(m	³)
Ground floor				(1a) x		2.65	(2a) =	226.05	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	85.3	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	226.05	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	-	0	Ī = Ī	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				3	x ′	10 =	30	(7a)
Number of passive vents	3			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_					
				_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue f	30		÷ (5) =	0.13	(8)
Number of storeys in t		ou to (11),	ouror wide t	oonanao n	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openi	resent, use the value corresponding t ngs); if equal user 0.35	o trie grea	ter wall are	ea (anter					
•	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2) v (14) · 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es ner h					area	5	(16)
,	lity value, then $(18) = [(17) \div 20] +$	•	•	•	10110 01 0	лтоюро	uiou	0.38	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			`
Number of sides sheltered	ed		(00) 4	50 0 7 5 (4	40)1			4	(19)
Shelter factor	ting abolton footon		(20) = 1 -		19)] =			0.7	(20)
Infiltration rate incorpora	•		(21) = (18) X (20) =				0.27	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		1 00	1 7.59	T COP		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]	
Wind Foster (00s) (2	2)		•	•	•			•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1 1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32	<u> </u>	1.00	1.14	1.10	J	

0.34 Calculate effect If mechanica	0.33 ctive air	0.33	0.29	0.29	0.25								
		change i	ate for t	he appli		0.25 se	0.25	0.27	0.29	0.3	0.31	J	
	al ventila	tion:										0	
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , other	wise (23b) = (23a)			0	
If balanced with	heat reco	very: effici	ency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				0	
a) If balance	d mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [1 – (23c)) ÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	
b) If balance					ı		- ^ ` 	<u> </u>			1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		
c) If whole h				•	•				E (22h	.\			
if (22b)n 24c)m= 0	0.5 x	0	0) = (23L 0	0	0	0 = (220)	0	0 × (230	0	0	1	
d) If natural	_			,								J	
if (22b)n									0.5]				
24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	
Effective air	change	rate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				-	
25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	
3. Heat losse	s and he	at loss r	naramete	or.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	е	ΑXk
	area	(m²)	m		A ,n		W/m2		(W/ł	<)	kJ/m²-		kJ/K
Vindows Type	: 1				2.59	x1	/[1/(1.4)+	0.04] =	3.43				
Vindows Type	2				2.59	х1	/[1/(1.4)+	0.04] =	3.43				
Vindows Type	3				5	x1.	/[1/(1.4)+	0.04] =	6.63				
loor					85.3	X	0.13	= [11.089				
Valls Type1	35.8	3	10.18	3	25.62	<u>x</u>	0.18	= [4.61				
Valls Type2	45.1	1	0		45.1	х	0.18	= [8.12				
otal area of e	lements	, m²			166.2	2							
for windows and * include the area						ated using	formula 1.	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	h 3.2	
abric heat los	s, W/K =	= S (A x	U)	·			(26)(30)	+ (32) =				37.3	31
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	639	7.5
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		25	0
or design assess an be used inste				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge				using Ap	pendix k	<						8.3	1
details of therma	,	,		• .	•								<u> </u>
otal fabric he	at loss							(33) +	(36) =			45.6	62
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		
88)m= 41.65	41.48	41.31	40.54	40.39	39.71	39.71	39.59	39.97	40.39	40.69	40.99]	
laat transfar s	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
ieai iransiei c													

eat loss para	meter (H	HLP), W/	m²K		_	_		(40)m	= (39)m ÷	- (4)			
0)m= 1.02	1.02	1.02	1.01	1.01	1	1	1	1	1.01	1.01	1.02		
umber of day	s in mo	nth <i>(</i> Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.01	(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 ene	rgy 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.		56		(42
nnual averag educe the annua ot more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		4.9		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		_
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	<u></u>	1138.8	(4
5)m= 154.81	135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		
									Total = Su	m(45) ₁₁₂ =	=	1493.14	(4
instantaneous w									1	i			
6)m= 23.22 /ater storage	20.31 loss:	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(4
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
community h	_			-			' '						
therwise if no ater storage		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day):				1.	65		(4
, emperature fa					•	,					54		(4
nergy lost fro				ear			(48) x (49)) =			89		(5
) If manufact			-										
ot water stora community h	•			e 2 (KVV	h/litre/da	ay)					0		(5
olume factor	_		JII 4 .5								0		(5
emperature fa	actor fro	m Table	2b							—	0		(5
nergy lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(5
nter (50) or (54) in (5	55)	·							0.	89		(5
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(5
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 Appendix	кН	
7)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(5
rimary circuit	loss (ar	nnual) fro	m Table	<u></u>							0		(5
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
		23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(5

Combiless	o louloto d	for ooob	manth /	(64)m	(CO) + 2(SE (41)	١,,,,						
Combi loss of (61)m= 0	o la culated	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0	1	(61)
		<u> </u>								ļ] (59)m + (61)m	(01)
(62)m= 205.73		190.64	171.09	167.8	150.14	144.38	158.17	157.81	177.4	187.34	200.85	(39)111 + (61)111	(62)
Solar DHW inpu						<u> </u>				l		I	(02)
(add addition									i contribut	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	u water hea	ter				Į						ı	
(64)m= 205.73		190.64	171.09	167.8	150.14	144.38	158.17	157.81	177.4	187.34	200.85		
							Out	out from w	ater heate	r (annual)₁	12	2092.75	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	า] + 0.8 ว	k [(46)m	+ (57)m	+ (59)m	 .]	
(65)m= 92.21	1	87.2	79.93	79.6	72.96	71.82	76.4	75.51	82.79	85.33	90.59	Ī	(65)
include (57	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	ı ıeating	
5. Internal	<u> </u>			•	•						,	J. Company	
Metabolic ga	ins (Table	e 5), Wat	ts										
Jan	T '	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 127.7	9 127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 23.88	21.21	17.25	13.06	9.76	8.24	8.9	11.57	15.53	19.73	23.02	24.54		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		•	•	
(68)m= 230.1	6 232.55	226.53	213.72	197.54	182.34	172.19	169.8	175.82	188.63	204.8	220.01		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78		(69)
Pumps and f	ans gains	(Table 5	āa)					•		•		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)			•	•	•	•		
(71)m= -102.2	3 -102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23		(71)
Water heatin	g gains (1	rable 5)				•		•	•		•		
(72)m= 123.9	4 121.75	117.2	111.01	106.99	101.34	96.53	102.69	104.88	111.28	118.52	121.76		(72)
Total interna	al gains =				(66))m + (67)m	+ (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 442.3	2 439.85	425.31	402.12	378.63	356.26	341.95	348.4	360.57	383.97	410.68	430.65		(73)
6. Solar gai	ns:									•			
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		-	g_ 	_	FF		Gains	
	Table 6d		m²		l al	ble 6a	. <u> </u>	able 6b	_	able 6c		(W)	_
Northeast 0.9x	0.54	X	2.5	59	x 1	1.28	x	0.63	x	0.7	=	6.26	(75)
Northeast 0.9x	0.54	X	2.5	59	x1	1.28	x	0.63	x	0.7	=	6.26	(75)
Northeast 0.9x	0.54	X	5		x 1	1.28	x	0.63	x [0.7	=	12.09	(75)
Northeast 0.9x		Х	2.5	59	x 2	22.97	x	0.63	x	0.7	=	12.75	(75)
Northeast 0.9x	0.54	X	2.5	59	x 2	22.97	X	0.63	x	0.7	=	12.75	(75)

_				_									
Northeast _{0.9x}	0.54	X	5	X	22.97	×		0.63	x	0.7	=	24.61	(75)
Northeast _{0.9x}	0.54	X	2.59	X	41.38	×		0.63	X	0.7	=	22.97	(75)
Northeast _{0.9x}	0.54	X	2.59	×	41.38	x		0.63	x	0.7	=	22.97	(75)
Northeast _{0.9x}	0.54	X	5	X	41.38	x		0.63	X	0.7	=	44.34	(75)
Northeast _{0.9x}	0.54	X	2.59	×	67.96	x		0.63	x [0.7	=	37.72	(75)
Northeast _{0.9x}	0.54	X	2.59	X	67.96	x		0.63	x [0.7	=	37.72	(75)
Northeast 0.9x	0.54	X	5	×	67.96	×		0.63	x [0.7	=	72.82	(75)
Northeast _{0.9x}	0.54	X	2.59	×	91.35	x		0.63	x [0.7	=	50.71	(75)
Northeast _{0.9x}	0.54	X	2.59	x	91.35	x		0.63	x [0.7	=	50.71	(75)
Northeast 0.9x	0.54	X	5	×	91.35	×		0.63	x [0.7	=	97.89	(75)
Northeast _{0.9x}	0.54	X	2.59	x	97.38	x		0.63	x [0.7	=	54.06	(75)
Northeast _{0.9x}	0.54	X	2.59	x	97.38	x		0.63	x [0.7	=	54.06	(75)
Northeast _{0.9x}	0.54	X	5	×	97.38	×		0.63	x [0.7	=	104.36	(75)
Northeast _{0.9x}	0.54	X	2.59	×	91.1	×		0.63	x [0.7	=	50.57	(75)
Northeast _{0.9x}	0.54	X	2.59	×	91.1	×		0.63	x [0.7	=	50.57	(75)
Northeast _{0.9x}	0.54	X	5	X	91.1	×		0.63	x	0.7	=	97.63	(75)
Northeast _{0.9x}	0.54	Х	2.59	×	72.63	x		0.63	x	0.7	=	40.32	(75)
Northeast _{0.9x}	0.54	X	2.59	×	72.63	×		0.63	x [0.7	=	40.32	(75)
Northeast _{0.9x}	0.54	X	5	×	72.63	x		0.63	x	0.7	=	77.83	(75)
Northeast _{0.9x}	0.54	Х	2.59	×	50.42	x		0.63	x	0.7	=	27.99	(75)
Northeast _{0.9x}	0.54	X	2.59	X	50.42	×		0.63	x	0.7	=	27.99	(75)
Northeast _{0.9x}	0.54	X	5	x	50.42	x		0.63	x	0.7	=	54.03	(75)
Northeast _{0.9x}	0.54	X	2.59	X	28.07	×		0.63	x	0.7	=	15.58	(75)
Northeast _{0.9x}	0.54	X	2.59	×	28.07	×		0.63	x [0.7	=	15.58	(75)
Northeast _{0.9x}	0.54	X	5	x	28.07	x		0.63	x	0.7	=	30.08	(75)
Northeast _{0.9x}	0.54	X	2.59	×	14.2	×		0.63	x [0.7	=	7.88	(75)
Northeast _{0.9x}	0.54	X	2.59	×	14.2	×		0.63	x [0.7	=	7.88	(75)
Northeast _{0.9x}	0.54	X	5	x	14.2	x		0.63	x [0.7	=	15.21	(75)
Northeast _{0.9x}	0.54	X	2.59	x	9.21	x		0.63	x [0.7	=	5.11	(75)
Northeast 0.9x	0.54	X	2.59	×	9.21	×		0.63	x [0.7	=	5.11	(75)
Northeast _{0.9x}	0.54	X	5	×	9.21	×		0.63	x [0.7	=	9.87	(75)
Solar gains in v								Sum(74)m .		_		1	
(83)m= 24.62	50.11	90.28	148.27 199		12.48 198.7		8.46	110.01	61.24	30.98	20.1		(83)
Total gains – in			` ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	`				1 470 50 1	445.04	1 444 05	450.75	Ī	(04)
(84)m= 466.94	489.96	515.6	550.39 577.		68.73 540.7	2 50	06.86	470.58	445.21	441.65	450.75		(84)
7. Mean interr			`										_
Temperature of	_			_			9, Tł	ո1 (°C)				21	(85)
Utilisation fact				Ť		i				1		Ī	
Jan	Feb	Mar		ay	Jun Jul	\rightarrow	Aug	Sep	Oct	Nov	Dec		(00)
(86)m= 1	1	1	0.99 0.9	!_	0.83 0.66	I).72	0.93	0.99	1	1		(86)
Mean internal		- 1		<u> </u>	i			 		1	ı	1	(0=)
(87)m= 19.88	19.97	20.16	20.44 20.7	72 2	20.92 20.98	8 2	0.97	20.83	20.49	20.14	19.87		(87)

_														
•							from Ta		· ` ´					(00)
(88)m=	20.06	20.07	20.07	20.07	20.08	20.08	20.08	20.08	20.08	20.08	20.07	20.07		(88)
	ation fac		i			· ` ·	e Table	9a)						
(89)m=	1	1	0.99	0.98	0.92	0.76	0.54	0.6	0.88	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.56	18.69	18.97	19.37	19.77	20.02	20.08	20.07	19.92	19.45	18.95	18.54		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.21	19.32	19.55	19.89	20.23	20.46	20.52	20.51	20.36	19.96	19.53	19.19		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.21	19.32	19.55	19.89	20.23	20.46	20.52	20.51	20.36	19.96	19.53	19.19		(93)
8. Spa	ace hea	ting requ	uirement											
			ternal ter or gains	•		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Juli	Jul	Aug	ССР	001	1107	Dec		
(94)m=	1	1	0.99	0.98	0.93	0.79	0.6	0.66	0.9	0.98	1	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m	l	l		l					
(95)m=	465.9	488.32	512.02	538.94	537.19	448.99	325.48	335.52	422.68	437.81	439.81	449.93		(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=	1301.08	1255.75	1134.4	947.2	733.84	499.94	334.38	350.28	536.07	804.95	1073.07	1298.34		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	621.38	515.71	463.05	293.95	146.31	0	0	0	0	273.16	455.95	631.22		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3400.72	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								39.87	(99)
9a. En	ergy rec	quiremer	nts – Ind	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_										1		_
	_		at from s			mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain 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)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	621.38	515.71	463.05	293.95	146.31	0	0	0	0	273.16	455.95	631.22		
(211)m	n = {[(98)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
	664.58	551.56	495.24	314.38	156.48	0	0	0	0	292.15	487.64	675.1		
			-			-	-	Tota	I (kWh/yea	ar) =Sum(2	211),15,1012		3637.13	(211)
•		•	econdar	• , .	month							'		
			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0 Tota	0	0	0	0		7(045)
								rota	ıl (kWh/yea	zi) ≓OUIII(2	- 10) _{15,1012}	_	0	(215)
01	-C A D OO4	2 \/araian	. 4 0 5 40	C A D A AA	http://wa								Dogo	^ -£ 7

Water heating								
Output from water heater (calculated above) 205.73 181.39 190.64 171.09 167.8 1	50.14 144.38	158.17	157.81	177.4	187.34	200.85]	
Efficiency of water heater		1		1	1		79.8	(216)
(217)m= 87.58 87.45 87.09 86.25 84.45	79.8 79.8	79.8	79.8	85.96	87.1	87.66		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•	•					•	
· / · · · · · · · · · · · · · · · · · ·	88.14 180.93	198.21	197.76	206.37	215.09	229.11		_
		Tota	I = Sum(2	19a) ₁₁₂ =			2473.92	(219)
Annual totals				k'	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1							3637.13	_
Water heating fuel used							2473.92	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2300
boiler with a fan-assisted flue						45		(230e
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							421.71	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHF						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	785.62	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	534.37	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1319.99	(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	=	218.87	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1577.78	(272)

TER =

(273)

27.01

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:48

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 91.6m2

2_01 - 3B5P Site Reference: **Tottenham Mews Plot Reference:**

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

22.63 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 9.57 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.5 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70) OK

Floor (no floor)

Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.61	
Maximum	1.5	ОК
MVHR efficiency:	79%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
ased on:		
Overshading:	Average or unknown	
Windows facing: South West	3.29m ²	
Windows facing: North West	14.56m²	
Windows facing: South West	1.65m²	
Windows facing: South West	2.12m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller bli	nd
	Closed 100% of daylight hours	
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from electric heat pump		

Photovoltaic array

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.5.12	
Address	F	Property	Address	: 2_01 -	3B5P				
Address: 1. Overall dwelling dime	ensions:								
The Overall awailing all the		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			91.6	(1a) x	2	2.65	(2a) =	242.74	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	91.6	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	242.74	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	_ + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	- + [0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				0	x 1	10 =	0	(7a)
Number of passive vents	3			Ī	0	x 1	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	x 4	40 =	0	(7c)
				_			A: I		
	6	-	(-)	_				nanges per ho	_
	eys, flues and fans = (6a)+(6b)+(been carried out or is intended, procee			continue fi	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		, a to (, , , ,	ouror moo (soriariao ri	0111 (0) 10	(10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	0.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openi	resent, use the value corresponding t ings); if equal user 0.35	o trie grea	ter wall are	a (aπer					
If suspended wooden	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
<u>-</u>	s and doors draught stripped		0.05 [0.0	(4.4) 4	1001			0	(14)
Window infiltration			0.25 - [0.2] (8) + (10)	. ,	-	± (15) =		0	(15)
Infiltration rate	q50, expressed in cubic metro	oc por b					oroo	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	ietie oi e	rivelope	alea	0.15	(17)
•	es if a pressurisation test has been do				is being u	sed		0.13	(10)
Number of sides sheltered	ed							4	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.7	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.1	(21)
Infiltration rate modified	for monthly wind speed							1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7		,					,	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (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]	
-								_	

· —		e (allowi				` 	`	<u> </u>	0.44	0.40		1	
0.13 Calculate effe	0.13 Ctive air	0.13 Change i	0.12 rate for t	0.11 he appli	0.1 cable ca	0.1 S e	0.1	0.1	0.11	0.12	0.12		
If mechanica		-										0.5	(23
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	Table 4h) =				67.15	(23
a) If balance	d mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29		(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	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				•	•				- (00)	,			
if (22b)n		<u> </u>		, ,	<u> </u>	· ` ·	ŕ	<u> </u>	· ` `		Ι ο	1	(2)
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n		on or wh en (24d)			•				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	ıter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				J	
25)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29]	(2
												ı	
3. Heat losse	_	·			NIat Aa		I I l		A 3/ 1.1		la comba	- ^	V I
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	〈)	k-value kJ/m²-		X X k J/K
Vindows Type	1				3.29	x1.	/[1/(1.1)+	0.04] =	3.47	,			(2
Vindows Type	2				3.64	x1,	/[1/(1.1)+	0.04] =	3.84	Ħ			(27
Vindows Type	3				1.65	x1.	/[1/(1.1)+	0.04] =	1.74	=			(27
Vindows Type	4				2.12	x1.	/[1/(1.1)+	0.04] =	2.23				(27
Valls Type1	64.	1	21.62	2	42.48	x	0.2	i	8.5	=			(29
Valls Type2	12.	2	0	=	12.2	X	0.19	╡┇	2.26	≓ i		-	(29
otal area of e					76.3								` (3 [,]
for windows and	roof wind	ows, use e	ffective wi	ndow U-va		 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragrapl	1 3.2	`
* include the area				s and part	titions		(0.0)	(00)					
abric heat los		•	U)				(26)(30)					33.53	(3:
leat capacity	`	,							.(30) + (32	, , ,	(32e) =	0	(34
hermal mass	•	•		•					tive Value:			100	(3
For design assess an be used inste				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						11.45	(36
details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								`
otal fabric he	at loss							(33) +	(36) =			44.98	(3
entilation 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= 23.88	23.67	23.46	22.41	22.2	21.15	21.15	20.94	21.57	22.2	22.62	23.04		(3
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
39)m= 68.86	68.65	68.44	67.39	67.18	66.13	66.13	65.92	66.55	67.18	67.6	68.02		

umber of days	0.75	0.75	0.74	0.73	0.72	0.70	I		I				
				0.75	0.72	0.72	0.72	0.73	0.73	0.74	0.74		
	s in mor	oth (Tabi	lo 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.74	(4
l Jan l	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
		!					ļ	ļ	<u> </u>	ļ			
. Water heati	ng ener	gy requi	rement:								kWh/yea	ir:	
sumed occup 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.		65		(4
inual average duce the annual t more that 125 l	average	hot water	usage by t	5% if the a	lwelling is	designed t			se target o		.07		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage in	litres per	day for ea	ich month	Vd,m = fa	ctor from T	able 1c x	(43)						
)m= 106.77	102.89	99.01	95.12	91.24	87.36	87.36	91.24	95.12	99.01	102.89	106.77		
ergy content of I	hot water	used - cal	culated mo	onthly = 4	190 x Vd.n	n x nm x F.	OTm / 3600			m(44) ₁₁₂ =		1164.79	(-
m= 158.34	138.49	142.91	124.59	119.55	103.16	95.59	109.69	111	129.36	141.21	153.34		
								l .		m(45) ₁₁₂ =		1527.23	
stantaneous wa	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					_
)m= 23.75	20.77	21.44	18.69	17.93	15.47	14.34	16.45	16.65	19.4	21.18	23		(
ater storage l orage volume		includin	ıa anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(
community he	` ,					ŭ							`
nerwise if no	-			_			, ,	ers) ente	er '0' in (47)			
ater storage l		المعتمال	aaa faatu	مسامات	/1.\\//	/da./\							,
If manufactumperature fa				or is kno	wn (Kvvr	i/day):					24		(
ergy lost fror				ar			(48) x (49)) <u> </u>			.6		(
If manufactu		_	-		or is not		(40) X (40)	, –		1.	34		(
t water stora	-			e 2 (kWl	h/litre/da	ıy)					0		(
community he lume factor f	-		on 4.3										,
mperature fa			2b							-	0		(
· ergy lost fror				ear			(47) x (51)) x (52) x (53) =				(
nter (50) or (5		_	, .,					, , , ,	,	-	34		(
ater storage l	oss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(
linder contains	dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	Н	
)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(
	loss (an	nual) fro	m Table	3							0		(
mary circuit	iooo (an												
mary circuit mary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0 (0	0	0	0	0	Т	0	0	0	0	1	(61)
Total heat require	ed for wate	er he	ating ca	alculated	l for ea	ach month	(62)r	n =	0.85 x (45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
	97.13 207		187.42	184.47	165.9		174.	_	173.83	194.29	204.04	218.27]	(62)
Solar DHW input cald	culated using	Appe	ndix G or	Appendix	H (neg	ative quantit	y) (ente	er '0'	if no sola	r contribu	tion to wate	er heating)	.	
(add additional li	nes if FGH	IRS a	and/or V	VWHRS	appli	es, see Ap	pend	ix G	i)					
(63)m= 0	0 (0	0	0	0	0		0	0	0	0]	(63)
Output from water heater														
(64)m= 223.27 1	97.13 207	7.83	187.42	184.47	165.9	9 160.52	174.	62	173.83	194.29	204.04	218.27]	
	•					•	(Outpu	ut from wa	ater heate	r (annual) ₁	12	2291.68	(64)
Heat gains from	water heat	ting, I	kWh/mo	onth 0.2	5 ′ [0.8	35 × (45)m	ı + (6	1)m]] + 0.8 x	(46)m	+ (57)m	+ (59)m	۱]	
(65)m= 104.59 9	92.96 99.	46	91.69	91.69	84.57	7 83.73	88.4	11	87.17	94.95	97.22	102.93]	(65)
include (57)m	in calculat	ion of	f (65)m	only if c	ylinde	r is in the	dwelli	ng c	or hot w	ater is f	rom com	munity h	- neating	
5. Internal gain	s (see Tab	ole 5	and 5a)):										
Metabolic gains	(Table 5),	Watts	S											
Jan		lar	Apr	May	Jur	n Jul	Αι	ıg	Sep	Oct	Nov	Dec]	
(66)m= 132.35 1	32.35 132	.35	132.35	132.35	132.3	5 132.35	132.	35	132.35	132.35	132.35	132.35]	(66)
Lighting gains (ca	alculated i	n App	oendix l	_, equat	ion L9	or L9a), a	lso se	ee T	able 5				-	
(67)m= 21.59	19.18 15.	59	11.81	8.83	7.45	8.05	10.4	16	14.05	17.83	20.81	22.19]	(67)
Appliances gains	(calculate	ed in	Append	lix L, eq	uation	L13 or L1	3a), a	also	see Tal	ole 5			•	
(68)m= 241.99 2	244.5 238	3.17	224.7	207.7	191.7	1 181.04	178.	53	184.85	198.33	215.33	231.31]	(68)
Cooking gains (c	alculated i	in Ap	pendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5			•	
(69)m= 36.23	36.23 36.	23	36.23	36.23	36.23	36.23	36.2	23	36.23	36.23	36.23	36.23]	(69)
Pumps and fans	gains (Tal	ole 5a	a)			•							•	
(70)m= 0	0 ()	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evap	oration (n	egati	ve value	es) (Tab	le 5)	-					-		-	
(71)m= -105.88 -1	05.88 -105	5.88	-105.88	-105.88	-105.8	88 -105.88	-105.	.88	-105.88	-105.88	-105.88	-105.88]	(71)
Water heating ga	ains (Table	5)	-		-	-			,		-	-	-	
(72)m= 140.58 1	38.33 133	.68	127.35	123.24	117.4	5 112.53	118.	84	121.07	127.63	135.02	138.34]	(72)
Total internal ga	ains =	-			(66)m + (67)n	า + (68)m +	(69)m + (70)m + (7	'1)m + (72))m	-	
(73)m= 466.86 4	64.72 450	.15	426.56	402.47	379.3	2 364.33	370.	53	382.68	406.49	433.88	454.55]	(73)
6. Solar gains:														
Solar gains are cald	_		flux from	Table 6a		·	ations t	o cor	nvert to th	e applical		tion.		
Orientation: Acc	cess Facto ole 6d	r	Area m²			Flux Fable 6a			g_ able 6b	т	FF able 6c		Gains (W)	
		, ,			· ·		, ,	1 6		, , ,				1
Southwest _{0.9x}	0.54	X	3.2	9	x	36.79	ן וְ		0.44	x	0.8	=	20.71	(79)
Southwest _{0.9x}	0.54	X	1.6	5	x	36.79	ַן וְ		0.44	x	0.8	=	10.39	(79)
Southwest _{0.9x}	0.54	X	2.1		x	36.79	֡֓֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓		0.44	x	0.8	=	13.34	(79)
Southwest _{0.9x}	0.54	X	3.2	9	x _	62.67	ļļ		0.44	_	0.8	=	35.27	(79)
Southwest _{0.9x}	0.54	X	1.6	5	x	62.67	J [0.44	X	0.8	=	17.69	(79)

Southwests o		7		1		1		l		1		7(70)
Southwest _{0.9x}	0.54	X	2.12	X	62.67] 1	0.44	X	0.8] = 1	22.73	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75	<u> </u>	0.44	X	0.8	=	48.26	(79)
Southwest _{0.9x}	0.54	X	1.65	X	85.75] i	0.44	X	0.8	=	24.21	(79)
Southwest _{0.9x}	0.54	X	2.12	X	85.75		0.44	X	0.8	=	31.1	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25		0.44	X	0.8	=	59.8	(79)
Southwest _{0.9x}	0.54	X	1.65	X	106.25		0.44	X	0.8] =	29.99	(79)
Southwest _{0.9x}	0.54	X	2.12	X	106.25		0.44	X	0.8	=	38.53	(79)
Southwest _{0.9x}	0.54	X	3.29	X	119.01		0.44	X	0.8	=	66.98	(79)
Southwest _{0.9x}	0.54	X	1.65	X	119.01		0.44	X	0.8	=	33.59	(79)
Southwest _{0.9x}	0.54	X	2.12	X	119.01	[0.44	X	0.8	=	43.16	(79)
Southwest _{0.9x}	0.54	X	3.29	X	118.15		0.44	X	0.8	=	66.5	(79)
Southwest _{0.9x}	0.54	X	1.65	X	118.15		0.44	X	0.8	=	33.35	(79)
Southwest _{0.9x}	0.54	X	2.12	X	118.15		0.44	X	0.8	=	42.85	(79)
Southwest _{0.9x}	0.54	X	3.29	X	113.91		0.44	X	0.8	=	64.11	(79)
Southwest _{0.9x}	0.54	X	1.65	X	113.91		0.44	X	0.8	=	32.15	(79)
Southwest _{0.9x}	0.54	X	2.12	X	113.91		0.44	X	0.8	=	41.31	(79)
Southwest _{0.9x}	0.54	X	3.29	X	104.39		0.44	X	0.8	=	58.75	(79)
Southwest _{0.9x}	0.54	X	1.65	X	104.39		0.44	x	0.8	=	29.47	(79)
Southwest _{0.9x}	0.54	X	2.12	X	104.39]	0.44	X	0.8	=	37.86	(79)
Southwest _{0.9x}	0.54	X	3.29	X	92.85		0.44	X	0.8	=	52.26	(79)
Southwest _{0.9x}	0.54	X	1.65	X	92.85		0.44	X	0.8	=	26.21	(79)
Southwest _{0.9x}	0.54	X	2.12	X	92.85		0.44	X	0.8	=	33.67	(79)
Southwest _{0.9x}	0.54	X	3.29	X	69.27		0.44	X	0.8	=	38.99	(79)
Southwest _{0.9x}	0.54	X	1.65	X	69.27		0.44	X	0.8	=	19.55	(79)
Southwest _{0.9x}	0.54	X	2.12	X	69.27		0.44	X	0.8	=	25.12	(79)
Southwest _{0.9x}	0.54	X	3.29	X	44.07		0.44	X	0.8	=	24.8	(79)
Southwest _{0.9x}	0.54	X	1.65	X	44.07		0.44	X	0.8	=	12.44	(79)
Southwest _{0.9x}	0.54	X	2.12	X	44.07		0.44	X	0.8	=	15.98	(79)
Southwest _{0.9x}	0.54	X	3.29	X	31.49		0.44	X	0.8	=	17.72	(79)
Southwest _{0.9x}	0.54	X	1.65	X	31.49		0.44	X	0.8	=	8.89	(79)
Southwest _{0.9x}	0.54	X	2.12	X	31.49		0.44	X	0.8	=	11.42	(79)
Northwest _{0.9x}	0.54	X	3.64	X	11.28	x	0.44	x	0.8	=	28.1	(81)
Northwest 0.9x	0.54	X	3.64	X	22.97	x	0.44	x	0.8	=	57.21	(81)
Northwest _{0.9x}	0.54	X	3.64	x	41.38	x	0.44	x	0.8	=	103.07	(81)
Northwest _{0.9x}	0.54	X	3.64	x	67.96	x	0.44	x	0.8	=	169.26	(81)
Northwest _{0.9x}	0.54	x	3.64	x	91.35	x	0.44	x	0.8] =	227.53	(81)
Northwest _{0.9x}	0.54	x	3.64	x	97.38	x	0.44	x	0.8	j =	242.57	(81)
Northwest _{0.9x}	0.54	x	3.64	x	91.1	x	0.44	x	0.8	j =	226.92	(81)
Northwest _{0.9x}	0.54	x	3.64	x	72.63	×	0.44	x	0.8	=	180.9	(81)
Northwest _{0.9x}	0.54	×	3.64	x	50.42	x	0.44	x	0.8] =	125.59	(81)
Northwest _{0.9x}	0.54	×	3.64	x	28.07	x	0.44	x	0.8	j =	69.91	(81)
_		-		•		•				•		_

Northwe	est _{0.9x}	0.54	х	3.6	64	x	14.2	x	0.44	x	0.8	=	35.36	(81)
Northwe	est _{0.9x}	0.54	x	3.6	64	x	9.21	x	0.44	_ x _	0.8	-	22.95	(81)
	_													
Solar g	ains in	watts, ca	alculated	for eacl	h month			(83)m = S	um(74)m .	(82)m				
(83)m= 72.54 132.9 206.64 297.59 371.26 385.26 364.49 306.98 237.73 153.57 88.59 60.98													(83)	
Total gains – internal and solar (84)m = (73)m + (83)m , watts												•		
(84)m= 539.4 597.62 656.79 724.15 773.73 764.59 728.82 677.51 620.41 560.06 522.46 515.53													(84)	
7. Mean internal temperature (heating season)														
Temp	erature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see T	able 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.94	0.9	0.82	0.69	0.52	0.39	0.43	0.65	0.86	0.94	0.97		(86)
Mean	interna	l temper	ature in I	living are	ea T1 (fo	ollow st	eps 3 to 7	in Tabl	e 9c)		•		•	
(87)m=	19.57	19.77	20.1	20.5	20.79	20.94	20.98	20.98	20.87	20.5	19.98	19.53		(87)
Tomp	oroturo	during h	LI	oriodo ir	root of	dwallia	a from To	hla O T	h2 (°C)		l			
(88)m=	20.3	20.3	20.3	20.31	20.31	20.32	g from Ta 20.32	20.32	20.32	20.31	20.31	20.3		(88)
			<u> </u>		<u> </u>	ļ	<u> </u>	<u> </u>	20.02	20.01	20.01	20.0		(00)
I							ee Table	r	0.0	0.00	0.00	0.00	1	(89)
(89)m=	0.96	0.93	0.89	0.8	0.66	0.47	0.33	0.37	0.6	0.83	0.93	0.96		(69)
I			ature in t		of dwelli		follow ste	r i	7 in Tabl	e 9c)			Ī	
(90)m=	18.35	18.64	19.11	19.68	20.07	20.27	20.31	20.31	20.19	19.69	18.95	18.31		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.45	(91)
Mean														
	interna	l temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 – fL	A) × T2					
(92)m=	interna 18.91	19.16	ature (fo	r the wh 20.05	ole dwe 20.4	lling) =	fLA × T1 20.62	+ (1 – fL 20.61	A) × T2	20.06	19.42	18.86		(92)
(92)m=	18.91 adjustn	19.16	19.56	20.05	20.4	20.57	1	20.61	20.5		19.42	18.86		(92)
(92)m= Apply (93)m=	18.91 adjustn 18.91	19.16 nent to tl	19.56 he mean 19.56	20.05	20.4	20.57	20.62	20.61	20.5		19.42	18.86		(92)
(92)m= Apply (93)m= 8. Spa	18.91 adjustn 18.91 ace hea	19.16 nent to the 19.16 ting requ	19.56 he mean 19.56 uirement	20.05 internal 20.05	20.4 temper 20.4	20.57 ature fr 20.57	20.62 om Table 20.62	20.61 4e, whe	20.5 ere appro 20.5	opriate 20.06	19.42	18.86		
(92)m= Apply (93)m= 8. Spa Set Ti	18.91 adjustn 18.91 ace hea	19.16 nent to the standard sta	19.56 he mean 19.56 uirement ernal ten	20.05 internal 20.05 nperatui	20.4 I temper 20.4 re obtain	20.57 ature fr 20.57	20.62 om Table	20.61 4e, whe	20.5 ere appro 20.5	opriate 20.06	19.42	18.86	culate	
(92)m= Apply (93)m= 8. Spa	adjustn 18.91 ace hea to the r	19.16 nent to the string requirement interpretation for the string requirement into factor for the string requirement into the string requirement into the string requirement into the string requirement in the string requiremen	19.56 he mean 19.56 uirement ternal ten	20.05 internal 20.05 nperaturusing Ta	20.4 temper 20.4 re obtainable 9a	20.57 ature fr 20.57	20.62 om Table 20.62 tep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	opriate 20.06 t Ti,m=(19.42 76)m an	18.86 d re-cald	culate	
(92)m= Apply (93)m= 8. Spa Set Ti the ut	adjustn 18.91 ace hea to the r ilisation Jan	19.16 nent to the second secon	19.56 he mean 19.56 uirement ernal ten or gains t	20.05 internal 20.05 inperaturusing Ta	20.4 I temper 20.4 re obtain	20.57 ature fr 20.57	20.62 om Table 20.62	20.61 4e, whe	20.5 ere appro 20.5	opriate 20.06	19.42	18.86	culate	
(92)m= Apply (93)m= 8. Spa Set Ti the ut	adjustn 18.91 ace hea to the r ilisation Jan	19.16 nent to the second secon	19.56 he mean 19.56 uirement ternal ten	20.05 internal 20.05 inperaturusing Ta	20.4 temper 20.4 re obtainable 9a	20.57 ature fr 20.57	20.62 om Table 20.62 tep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	opriate 20.06 t Ti,m=(19.42 76)m an	18.86 d re-cald	culate	
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m=	adjustn 18.91 ace hea to the rilisation Jan ation face	19.16 nent to tl 19.16 ting requirement int factor for general for general for general factor	19.56 he mean 19.56 uirement ernal ten or gains t Mar ains, hm	20.05 internal 20.05 inperaturusing Ta Apr : 0.79	20.4 I temper 20.4 re obtainable 9a May 0.66	20.57 ature fr 20.57 ature data	20.62 com Table 20.62 tep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	20.06 t Ti,m=(19.42 76)m an	18.86 d re-cald	culate	(93)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m=	adjustn 18.91 ace hea to the rilisation Jan ation face	19.16 nent to tl 19.16 ting requirement int factor for general for general for general factor	19.56 he mean 19.56 uirement ernal ten or gains t Mar ains, hm	20.05 internal 20.05 inperaturusing Ta Apr : 0.79	20.4 I temper 20.4 re obtainable 9a May 0.66	20.57 ature fr 20.57 ature data	20.62 com Table 20.62 tep 11 of	20.61 4e, who 20.61 Table 9	20.5 ere appro 20.5 b, so tha	20.06 t Ti,m=(19.42 76)m an	18.86 d re-cald	culate	(93)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m=	adjustn 18.91 ace hea i to the r illisation Jan ation face 0.94 Il gains, 508.58	19.16 nent to the second requirement into factor for gradient to for gradient factor	19.56 he mean 19.56 uirement ernal ten or gains u Mar ains, hm 0.88 , W = (94	20.05 internal 20.05 nperaturusing Ta Apr : 0.79 l)m x (84 574.14	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46	20.57 ature frr 20.57 aed at s Jun 0.49	20.62 cm Table 20.62 tep 11 of Jul 0.36	20.61 4e, who 20.61 Table 9 Aug	20.5 ere appro 20.5 b, so that Sep 0.62	opriate 20.06 t Ti,m=(19.42 76)m an Nov	18.86 d re-cald Dec 0.95	culate	(93)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m=	adjustn 18.91 ace hea i to the r illisation Jan ation face 0.94 Il gains, 508.58	19.16 nent to the second requirement into factor for gradient to for gradient factor	19.56 he mean 19.56 uirement ernal ten or gains t Mar ains, hm 0.88 , W = (94	20.05 internal 20.05 nperaturusing Ta Apr : 0.79 l)m x (84 574.14	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46	20.57 ature frr 20.57 aed at s Jun 0.49	20.62 cm Table 20.62 tep 11 of Jul 0.36	20.61 4e, who 20.61 Table 9 Aug	20.5 ere appro 20.5 b, so that Sep 0.62	opriate 20.06 t Ti,m=(19.42 76)m an Nov	18.86 d re-cald Dec 0.95	culate	(93)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m=	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera	19.16 nent to the second responsible second respons	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1	20.05 internal 20.05 nperatur using Ta Apr : 0.79 l)m x (84 574.14 perature 8.9	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta 11.7	20.57 ature fr 20.57 aed at s Jun 0.49 376 able 8 14.6	20.62 com Table 20.62 tep 11 of Jul 0.36 260.93	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71	20.5 ere appro 20.5 b, so that Sep 0.62 382.99	opriate 20.06 t Ti,m=(Oct 0.83 462.28	19.42 76)m an Nov 0.92	18.86 d re-calc Dec 0.95 489.36	culate	(93) (94) (95)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera	19.16 nent to the second results of the seco	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1	20.05 internal 20.05 nperatur using Ta Apr : 0.79 l)m x (84 574.14 perature 8.9	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta 11.7	20.57 ature fr 20.57 aed at s Jun 0.49 376 able 8 14.6	20.62 com Table 20.62 tep 11 of Jul 0.36 260.93	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71	20.5 ere appro 20.5 b, so that Sep 0.62 382.99	opriate 20.06 t Ti,m=(Oct 0.83 462.28	19.42 76)m an Nov 0.92	18.86 d re-calc Dec 0.95 489.36	culate	(93) (94) (95)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m=	adjustn 18.91 ace hea to the rillisation Jan ation fac 0.94 Il gains, 508.58 aly avera 4.3 loss rate 1005.74 e heatine	19.16 nent to the second record for green interpretation for green inte	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1 Frnal tem 6.5 an intern	20.05 internal 20.05 inperatur using Ta Apr : 0.79 inperatur 574.14 perature 8.9 al tempe 751.54	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4	20.57 ature fr 20.57 aed at s Jun 0.49 376 able 8 14.6 Lm , W 395.07	20.62 com Table 20.62 tep 11 of Jul 0.36 260.93 16.6 =[(39)m	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5	19.42 76)m and Nov 0.92 479.27 7.1	18.86 d re-calc Dec 0.95 489.36	culate	(93) (94) (95) (96)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m=	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera 4.3 loss rate	19.16 nent to the second record for green interpretation for green inte	19.56 he mean 19.56 Direment remal ten or gains to Mar ains, hm 0.88 , W = (94 577.1 Frnal tem 6.5 an intern	20.05 internal 20.05 inperatur using Ta Apr : 0.79 inperatur 574.14 perature 8.9 al tempe 751.54	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4	20.57 ature fr 20.57 aed at s Jun 0.49 376 able 8 14.6 Lm , W 395.07	20.62 com Table 20.62 tep 11 of Jul 0.36 260.93 16.6 =[(39)m 265.59	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59 24 x [(97	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86 0	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5)m] x (4 128.88	19.42 76)m and Nov 0.92 479.27 7.1 832.71 1)m 254.48	18.86 Dec 0.95 489.36 4.2 997.49 378.05		(93) (94) (95) (96) (97)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m= Space	adjustn 18.91 ace hea to the rillisation Jan ation fac 0.94 Il gains, 508.58 aly avera 4.3 loss rate 1005.74 e heatine	19.16 nent to the second results of the seco	19.56 he mean 19.56 uirement remail ten or gains to Mar ains, hm 0.88 , W = (94 577.1 ernal tem 6.5 an internal ement for	20.05 internal 20.05 nperaturating Ta Apr : 0.79 internal Apr : 0	20.4 I temper 20.4 re obtainable 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4 nonth, k	20.57 ature fr 20.57 ed at s Jun 0.49 376 able 8 14.6 Lm , W 395.07 Wh/mor	20.62 com Table 20.62 tep 11 of Jul 0.36 260.93 16.6 =[(39)m 265.59 nth = 0.02	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59 24 x [(97	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86)m - (95	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5)m] x (4 128.88	19.42 76)m and Nov 0.92 479.27 7.1 832.71 1)m 254.48	18.86 Dec 0.95 489.36 4.2 997.49 378.05	culate 1837.42	(93) (94) (95) (96)
(92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m= Usefu (95)m= Month (96)m= Heat I (97)m= Space (98)m=	adjustn 18.91 ace hea to the rilisation Jan ation face 0.94 Il gains, 508.58 ally avera 4.3 loss rate 1005.74 e heatine 369.88	19.16 nent to the second requirement in the	19.56 he mean 19.56 uirement remail ten or gains to Mar ains, hm 0.88 , W = (94 577.1 ernal tem 6.5 an internal ement for	20.05 internal 20.05 nperaturusing Ta Apr : 0.79 internal Apr : 0.79 al tempe 751.54 r each m 127.73	20.4 I temper 20.4 re obtain able 9a May 0.66 4)m 510.46 e from Ta 11.7 erature, 584.4 nonth, k\ 55.01	20.57 ature fr 20.57 ed at s Jun 0.49 376 able 8 14.6 Lm , W 395.07 Wh/mor	20.62 com Table 20.62 tep 11 of Jul 0.36 260.93 16.6 =[(39)m 265.59 nth = 0.02	20.61 4e, whe 20.61 Table 9 Aug 0.4 270.71 16.4 x [(93)m 277.59 24 x [(97	20.5 ere appro 20.5 b, so that Sep 0.62 382.99 14.1 - (96)m 425.86 0	opriate 20.06 t Ti,m=(Oct 0.83 462.28 10.6] 635.5)m] x (4 128.88	19.42 76)m and Nov 0.92 479.27 7.1 832.71 1)m 254.48	18.86 Dec 0.95 489.36 4.2 997.49 378.05		(93) (94) (95) (96) (97)

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) =	Ĭ	1	(302)
The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations.	•		–
Fraction of heat from Community heat pump	Ļ	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 commu	ınity heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	m [1.05	(306)
Space heating Annual space heating requirement	[kWh/year 1837.42	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1929.29	(307a)
Efficiency of secondary/supplementary heating system in % (fro	m Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary syst	em (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating	-		_ ¬
Annual water heating requirement If DHW from community scheme:	L	2291.68	
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2406.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	43.36	(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	225.81	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	225.81	(331)
Energy for lighting (calculated in Appendix L)		381.27	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-694.91	(333)
Electricity generated by wind turbine (Appendix M) (negative qu	antity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor I kWh/year kg CO2/kWh I	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 fuel	250	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x 0.52 =	900.06	(367)
Electrical energy for heat distribution	[(313) x 0.52 =	22.5	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372) =	922.56	(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 0.52 =	0	(375)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 922.56 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 117.19 CO2 associated with electricity for lighting (332))) x (379) 0.52 197.88 Energy saving/generation technologies (333) to (334) as applicable x = 0.01 =Item 1 (380)0.52 -360.66 sum of (376)...(382) =Total CO2, kg/year 876.98 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)9.57 El rating (section 14) (385)91.4

			User D	Notaile:						
	\". F = T		USELL					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 20 ⁷	12		Strom: Softwa					018096 on: 1.0.5.12	
Software Hame.	Stroma i S/ti 20		operty.	Address				VCISIC	71. 1.0.0.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	7(0-)	Volume(m ³	<u>-</u>
	\	\			(1a) x	2	2.65	(2a) =	242.74	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	91.6	(4)					_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	242.74	(5)
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır
N. sala and A. Parana	heating	heating	· —		, ,			40		_
Number of chimneys	0 +	0] † [0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] † L	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	3	X '	10 =	30	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	6a)+(6b)+(7a	a)+(7b)+(7c) =	Г	30		÷ (5) =	0.12	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.12	(0)
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber resent, use the value corre				•	ruction			0	(11)
deducting areas of openi		sponding to	ine great	er wan are	a (aitei					
If suspended wooden	floor, enter 0.2 (unsea	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 s	tripped							0	(14)
Window infiltration				0.25 - [0.2	. ,	_	. (45)		0	(15)
Infiltration rate	.50			(8) + (10)		, , ,	, ,		0	(16)
Air permeability value, If based on air permeabil	· ·		•	•	•	etre of e	envelope	area	5	(17)
Air permeability value applie						is beina u	sed		0.37	(18)
Number of sides sheltere			o	groo a po.			000		4	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.26	(21)
Infiltration rate modified f	or monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2\m ÷ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
									J	

0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
alculate effec		-	rate for t	he appli	cable ca	se					!	<u>-</u>	
If mechanical If exhaust air he			andiv N (2	3h) - (23a	a) v Emy (e	aguation (N	J5)) other	wice (23h) = (23a)			0	(2
If balanced with) = (23a)			0	(2
		•	-	_) (d	00h) [/	1 (00.0)	0	(2
a) If balance	o mech	anicai ve	niliation 0	with ne	at recove		$\frac{1R}{0}$	0 = (22	0 + (1)	23b) x [$\frac{1-(230)}{0}$) ÷ 100]]	(2
b) If balance												_	(-
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h							<u> </u>		Ů			_	
if (22b)n				•	•				5 × (23b))			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	n from l	oft				J	
if (22b)n				•	•				0.5]				
4d)m= 0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(:
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(:
s. Heat losse	e and he	at lose r	naramete	or.									
. Heat losse LEMENT	Gros	·	Openin		Net Ar	A 2	U-valı	IΩ	AXU		k-valu	Δ	ΑΧk
LEIVIEINI	area	_	m	_	A ,r		W/m2		(W/I	۲)	kJ/m².		kJ/K
indows Type	1				3.29	x1.	/[1/(1.4)+	0.04] =	4.36				(:
indows Type	2				3.64	x1.	/[1/(1.4)+	0.04] =	4.83				(:
indows Type	3				1.65	x1.	/[1/(1.4)+	0.04] =	2.19				(
indows Type	4				2.12	x1.	/[1/(1.4)+	0.04] =	2.81				(
alls Type1	64.	1	21.6	2	42.48	3 x	0.18	─ <u>-</u>	7.65	=			(:
alls Type2	12.		0	=	12.2	=	0.18		2.2	ᆿ 片		=	(;
otal area of e					76.3	=	0.10		2.2				(
or windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	e)+0.041 a	ns aiven in	paragrapi	h 3.2	(
include the area								2(), 5	-,	J	, g p.		
bric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				38.51	(
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(
r design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste				.a.'.a. A.	ا بنام محمد	,							 ,
nermal bridge	•	,			-	`						3.81	(
letails of therma Ital fabric he		are not kn	OWII (30) =	= 0.05 X (3	(1)			(33) +	(36) =			42.32	2 (3
entilation hea		alculated	monthly	/					= 0.33 × (25)m x (5))	72.02	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
3)m= 44.5	44.33	44.16	43.37	43.22	42.52	42.52	42.4	42.79	43.22	43.52	43.83	†	(
		<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>			<u> </u>	L	J	,
eat transfer of 86.83	86.65	86.48	85.69	85.54	84.84	84.84	84.72	85.11	= (37) + (3 85.54	85.84	86.15	7	

Heat loss para	meter (H	HLP), W/	'm²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.95	0.95	0.94	0.94	0.93	0.93	0.93	0.92	0.93	0.93	0.94	0.94		
Number of day	o in mor	oth /Tabl						,	Average =	Sum(40) ₁ .	12 /12=	0.94	(40)
Number of day 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>	,						Į				
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		65		(42)
if TFA £ 13.9	•	ator uooc	no in litro	o por de	w Vd ov	orogo –	(25 v NI)	. 26			1		(42)
Annual average Reduce the annual									se target o		.07		(43)
not more that 125	litres per p	oerson per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	i litres per	day for ea	nch month	Vd,m = fa	ctor from T	Γable 1c x	(43)						
(44)m= 106.77	102.89	99.01	95.12	91.24	87.36	87.36	91.24	95.12	99.01	102.89	106.77		_
Energy content of	hat water	unad aak	aulated my	onthly — 1	100 v Vd r	n v nm v [Tm / 2600			m(44) ₁₁₂ =	L	1164.79	(44)
Energy content of				-									
(45)m= 158.34	138.49	142.91	124.59	119.55	103.16	95.59	109.69	111	129.36	141.21	153.34	4507.00	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		10tai = Su	m(45) ₁₁₂ =		1527.23	(43)
(46)m= 23.75	20.77	21.44	18.69	17.93	15.47	14.34	16.45	16.65	19.4	21.18	23		(46)
Water storage	loss:								<u> </u>				
Storage volume	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	r (this in	icludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufactor		eclared k	oss facto	or is kno	wn (kWh	n/dav).				1	65		(48)
Temperature fa) 10 III10	**** (1**)	"day).					54		(49)
Energy lost from				ar			(48) x (49)) <u>=</u>			89		(50)
b) If manufacti		_	-		or is not		(10) // (10)	,		0.	09		(30)
Hot water stora	-			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	-		on 4.3										
Volume factor for Temperature fa			2h							—	0		(52)
•							(47) (54)	· · · (EQ) · · · (EO)		0		(53)
Energy lost from Enter (50) or (50)		•	, KVVII/ye	ear			(47) X (31)) x (52) x (53) =	-	0 89		(54) (55)
Water storage	, ,	,	or each	month			((56)m = (55) × (41)ı	m	0.	09		(00)
	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
(56)m= 27.66 If cylinder contains												хH	(30)
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Duine and airea sit	loos (on							l			0		(58)
Primary circuit	•	•			FO) /	(EQ) + 26	E (11)				·		(00)
Primary circuit	1055 120	CUICHELL	or each	monm c	SOME = 0	001 - 01);) X (4.11	m					
Primary circuit (modified by				•	•	. ,	, ,		r thermo	stat)			

Cambilaga a	الم مامان مام	for 00 ab		(C4)	(00) . 0	CF (44	\						
Combi loss ca	o localizated	or each	0	0	(60) ÷ 3	000 × (41	0	0	Ιο	0	0]	(61)
		<u> </u>	<u> </u>	<u> </u>	<u> </u>		ļ	ļ	<u> </u>		ļ	J (59)m + (61)m	(0.)
(62)m= 209.27	`	193.83	173.87	170.47	152.44	146.52	160.62	160.29	180.29	190.49	204.27	(59)111 + (61)111	(62)
Solar DHW input		L	L	<u> </u>		1		1				l	(02)
(add additiona									ii contribut	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	vater hea	ter	<u> </u>	ļ.			!	<u>ļ</u>	!	!	!	1	
(64)m= 209.27	1	193.83	173.87	170.47	152.44	146.52	160.62	160.29	180.29	190.49	204.27		
	<u> </u>					•	Out	put from w	ater heate	r (annual)₁	112	2126.84	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (61)r	n] + 0.8 :	x [(46)m	+ (57)m	+ (59)m]	-
(65)m= 93.39	82.84	88.26	80.85	80.49	73.73	72.53	77.21	76.34	83.75	86.38	91.73	[(65)
include (57)m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	<i>'</i>				-						•		
Metabolic gai	Ì			,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 132.35	132.35	132.35	132.35	132.35	132.35	132.35	132.35	132.35	132.35	132.35	132.35		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 d	r L9a), a	lso see	Table 5				ı	
(67)m= 21.85	19.41	15.78	11.95	8.93	7.54	8.15	10.59	14.22	18.05	21.07	22.46	1	(67)
Appliances ga	ains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), als	see Ta	ble 5			ı	
(68)m= 241.99	244.5	238.17	224.7	207.7	191.71	181.04	178.53	184.85	198.33	215.33	231.31		(68)
Cooking gain	s (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5			ı	
(69)m= 36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23		(69)
Pumps and fa	ans gains	(Table 5	Ба)	•		•	•	•	•	•	•	ı	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)		•		•	•	•		
(71)m= -105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.88	-105.88		(71)
Water heating	g gains (T	able 5)			•							•	
(72)m= 125.52	123.28	118.62	112.29	108.19	102.4	97.48	103.78	106.02	112.57	119.97	123.29		(72)
Total interna	l gains =				(66	5)m + (67)n	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 455.07	452.9	438.29	414.65	390.52	367.36	352.37	358.6	370.8	394.65	422.07	442.77		(73)
6. Solar gair	ns:												
Solar gains are		•	r flux from	Table 6a			ations to c	onvert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flo	ux ible 6a	_	g_ Fable 6b	т	FF able 6c		Gains (W)	
					T	ible ba	. –	able ob	_ '	able 60		(۷۷)	7
Southwest _{0.9x}		X	3.2	29	X	36.79	<u> </u>	0.63	x	0.7	=	25.94	<u> </u> (79)
Southwest _{0.9x}	0.01	X	1.6	55	x	36.79	<u> </u>	0.63	x	0.7	=	13.01	(79)
Southwest _{0.9x}	0.04	X	2.1			36.79	ļ <u>Ļ</u>	0.63	x	0.7	=	16.72	<u> </u> (79)
Southwest _{0.9x}		X	3.2	29	X	62.67	ļ <u>Ļ</u>	0.63	x	0.7	=	44.19	(79)
Southwest _{0.9x}	0.54	X	1.6	65	x	62.67		0.63	Х	0.7	=	22.16	(79)

О		1		1		ı				1		٦
Southwest _{0.9x}	0.54	X	2.12	X	62.67		0.63	X	0.7	=	28.48	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75		0.63	X	0.7	=	60.47	(79)
Southwest _{0.9x}	0.54	X	1.65	X	85.75		0.63	X	0.7] =	30.33	(79)
Southwest _{0.9x}	0.54	X	2.12	X	85.75		0.63	X	0.7	=	38.96	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25		0.63	X	0.7	=	74.92	(79)
Southwest _{0.9x}	0.54	X	1.65	x	106.25		0.63	X	0.7	=	37.57	(79)
Southwest _{0.9x}	0.54	X	2.12	x	106.25		0.63	X	0.7	=	48.28	(79)
Southwest _{0.9x}	0.54	X	3.29	X	119.01		0.63	X	0.7	=	83.92	(79)
Southwest _{0.9x}	0.54	X	1.65	X	119.01		0.63	X	0.7	=	42.09	(79)
Southwest _{0.9x}	0.54	X	2.12	X	119.01		0.63	X	0.7	=	54.08	(79)
Southwest _{0.9x}	0.54	X	3.29	x	118.15		0.63	X	0.7	=	83.31	(79)
Southwest _{0.9x}	0.54	X	1.65	x	118.15		0.63	X	0.7	=	41.78	(79)
Southwest _{0.9x}	0.54	X	2.12	x	118.15		0.63	X	0.7	=	53.68	(79)
Southwest _{0.9x}	0.54	X	3.29	x	113.91		0.63	X	0.7	=	80.32	(79)
Southwest _{0.9x}	0.54	X	1.65	x	113.91		0.63	X	0.7	=	40.28	(79)
Southwest _{0.9x}	0.54	x	2.12	x	113.91		0.63	X	0.7	=	51.76	(79)
Southwest _{0.9x}	0.54	X	3.29	x	104.39		0.63	X	0.7	=	73.61	(79)
Southwest _{0.9x}	0.54	X	1.65	x	104.39		0.63	X	0.7	=	36.92	(79)
Southwest _{0.9x}	0.54	x	2.12	x	104.39		0.63	x	0.7] =	47.43	(79)
Southwest _{0.9x}	0.54	x	3.29	x	92.85		0.63	x	0.7] =	65.47	(79)
Southwest _{0.9x}	0.54	X	1.65	x	92.85		0.63	X	0.7	=	32.84	(79)
Southwest _{0.9x}	0.54	x	2.12	x	92.85		0.63	x	0.7] =	42.19	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27		0.63	X	0.7	=	48.84	(79)
Southwest _{0.9x}	0.54	X	1.65	x	69.27		0.63	x	0.7] =	24.5	(79)
Southwest _{0.9x}	0.54	x	2.12	x	69.27		0.63	x	0.7] =	31.47	(79)
Southwest _{0.9x}	0.54	x	3.29	x	44.07		0.63	x	0.7] =	31.08	(79)
Southwest _{0.9x}	0.54	X	1.65	x	44.07		0.63	x	0.7] =	15.59	(79)
Southwest _{0.9x}	0.54	x	2.12	x	44.07		0.63	x	0.7] =	20.02	(79)
Southwest _{0.9x}	0.54	x	3.29	x	31.49		0.63	x	0.7] =	22.2	(79)
Southwest _{0.9x}	0.54	x	1.65	x	31.49		0.63	x	0.7	j =	11.14	(79)
Southwest _{0.9x}	0.54	x	2.12	x	31.49		0.63	x	0.7	=	14.31	(79)
Northwest _{0.9x}	0.54	x	3.64	х	11.28	x	0.63	x	0.7	j =	35.21	(81)
Northwest 0.9x	0.54	x	3.64	x	22.97	x	0.63	x	0.7] =	71.67	(81)
Northwest _{0.9x}	0.54	x	3.64	x	41.38	х	0.63	X	0.7	j =	129.13	(81)
Northwest _{0.9x}	0.54	x	3.64	x	67.96	х	0.63	X	0.7	j =	212.06	(81)
Northwest _{0.9x}	0.54	x	3.64	×	91.35	x	0.63	x	0.7	j =	285.05	(81)
Northwest _{0.9x}	0.54	x	3.64	x	97.38	x	0.63	x	0.7] =	303.9	(81)
Northwest _{0.9x}	0.54	x	3.64	x	91.1	x	0.63	x	0.7	i =	284.29	(81)
Northwest _{0.9x}	0.54	X	3.64	x	72.63	x	0.63	x	0.7	=	226.64	(81)
Northwest _{0.9x}	0.54	X	3.64	x	50.42	x	0.63	x	0.7	=	157.34	(81)
Northwest _{0.9x}	0.54	X	3.64	x	28.07	x	0.63	x	0.7	=	87.59	(81)
L		1		ı		ı						_

Northwest _{0.9x}	0.54	х	3.6	64	х	14.2	x	0.63	х	0.7	=	44.3	(81)
Northwest 0.9x	0.54	х	3.6	64	x	9.21	x	0.63	_ x [0.7	=	28.75	(81)
<u>-</u>		<u></u>					<u> </u>						
Solar gains in	watts, ca	alculated	for eac	h month		,	(83)m = 9	Sum(74)m .	(82)m			•	
(83)m= 90.88	166.5	258.88	372.84	465.13	482.67	456.65	384.6	297.84	192.4	110.99	76.4		(83)
Total gains – i				<u> </u>	<u> </u>			1				1	
(84)m= 545.95	619.4	697.17	787.49	855.65	850.03	809.02	743.2	668.64	587.05	533.06	519.17]	(84)
7. Mean inter	nal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ble 9, Th	n1 (°C)				21	(85)
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)			•			1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	<u> </u>	
(86)m= 1	1	0.99	0.95	0.82	0.62	0.46	0.52	0.8	0.97	1	1]	(86)
Mean interna	l temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to	7 in Tab	le 9c)				_	
(87)m= 20.04	20.17	20.4	20.69	20.9	20.99	21	21	20.94	20.66	20.29	20.01		(87)
Temperature	during h	eating p	eriods ir	n rest of	dwelling	g from Ta	able 9, T	h2 (°C)					
(88)m= 20.13	20.13	20.13	20.14	20.14	20.15	20.15	20.15	20.14	20.14	20.14	20.13		(88)
Utilisation fac	ctor for g	ains for i	rest of d	welling,	h2,m (s	ee Table	9a)		-		-	•	
(89)m= 1	0.99	0.98	0.93	0.77	0.55	0.37	0.43	0.73	0.96	0.99	1	1	(89)
Mean interna	l temper	ature in	the rest	of dwelli	na T2 (follow ste	eps 3 to	7 in Tab	le 9c)	•	•	•	
(90)m= 18.83	19.03	19.36	19.77	20.05	20.14	20.14	20.14	20.1	19.74	19.22	18.8]	(90)
		ļ		ļ	<u>!</u>		!	1	fLA = Livir	ng area ÷ (4) =	0.45	(91)
Mean interna	ıl temner	ature (fo	r the wh	ole dwe	lling) – i	fl Δ √ T1	⊥ (1 _ fl	Δ) v T2					_
(92)m= 19.38	19.55	19.83	20.19	20.44	20.52	20.53	20.53	20.48	20.16	19.7	19.35]	(92)
Apply adjustr	nent to the	he mean	interna	l temper	ature fro	om Table	4e, wh	ere appr	opriate	<u> </u>	I	1	
(93)m= 19.38	19.55	19.83	20.19	20.44	20.52	20.53	20.53	20.48	20.16	19.7	19.35		(93)
8. Space hea	iting requ	uirement											
Set Ti to the					ned at st	tep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-cald	culate	
the utilisation	Feb	or gains i			Jun	Jul	Διια	l son	Oct	Nov	Dec	1	
Utilisation fac			Apr	May	Juli	Jui	Aug	Sep	l Oct	INOV	Dec]	
(94)m= 1	0.99	0.98	0.93	0.79	0.58	0.41	0.47	0.75	0.96	0.99	1	1	(94)
Useful gains,	hmGm .	, W = (94	1)m x (8	4)m	l		<u> </u>	1	<u> </u>	<u> </u>	l	1	
(95)m= 544.1	614.75	682.56	730.85	678.02	493.41	332.65	347.96	504.68	561.49	529	517.83		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8				•			-	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate			<u> </u>				- ` 	- ` 		•		1	
(97)m= 1309.31	L	1152.79	967.29	747.21	502.4	333.61	349.98	543.03	817.52	1081.99	1305.14]	(97)
Space heatin	ř	1		i	T	1	T ` -	í · · · ·	í - `	r e	505.75	1	
(98)m= 569.32	439.88	349.85	170.23	51.47	0	0	0	0	190.49	398.15	585.75	0755 44	7(00)
				.,			I Ota	al per year	(kvvn/yea	ı) = Sum(9	O) _{15,912} =	2755.14	(98)
Space heatin	g require	ement in	kWh/m²	² /year								30.08	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating s	ystems	including	micro-(CHP)					
Space heating	•			1-									7,25
Fraction of sp	pace hea	at from se	econdar	y/supple	mentar	y 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) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system,	%						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above) 569.32 439.88 349.85 170.23 51.47	0	0	0	0	190.49	398.15	585.75]	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$				U	130.43	330.13	303.73		(211)
608.9 470.45 374.17 182.07 55.05	0	0	0	0	203.73	425.83	626.47		(211)
			Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	2946.67	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)	-							1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0	0 215) _{15.1012}	0		7(245)
Water heating			Total	i (KVVII/yea	ar) =3um(2	213) _{15,1012}	<u>-</u>	0	(215)
Output from water heater (calculated above)									
·	152.44	146.52	160.62	160.29	180.29	190.49	204.27		
Efficiency of water heater								79.8	(216)
` '	79.8	79.8	79.8	79.8	84.96	86.74	87.47		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	191.03	183.61	201.28	200.86	212.2	219.62	233.54		
			Tota	I = Sum(2	19a) ₁₁₂ =			2530.95	(219)
Annual totals					1.4	Mbhaa			
Space heating fuel used main evetem 1					K	Wh/year		kWh/yea	<u>r</u>
Space heating fuel used, main system 1					K	vvn/year		2946.67	r
Water heating fuel used					K	vvn/year			r
Water heating fuel used Electricity for pumps, fans and electric keep-hot					K	wnyear		2946.67	
Water heating fuel used					K	wnyear	30	2946.67	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot					K	wnyear		2946.67	
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =		30	2946.67	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue			sum	of (230a).			30	2946.67 2530.95	(230c) (230e)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	ns inclu	ding mid					30	2946.67 2530.95	(230c) (230e) (231)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting					(230g) =		30 45	2946.67 2530.95 75 385.9	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene				(230g) =	ion fac	30 45	2946.67 2530.95	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene	e rgy n/year			(230g) =	ion fac 2/kWh	30 45	2946.67 2530.95 75 385.9	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	Ene kWł	ergy n/year x			(230g) = Emiss kg CO	ion fac 2/kWh	30 45 tor	2946.67 2530.95 75 385.9 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Ene kWl (211)	ergy n/year x			(230g) = Emiss kg CO: 0.2	ion fac 2/kWh 16	30 45 tor	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0	(230c) (230e) (231) (232) Sar (261) (263)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	ergy n/year x x			(230g) = Emiss kg CO:	ion fac 2/kWh 16	30 45 tor = =	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0 546.69	(230c) (230e) (231) (232) Sar (261) (263) (264)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kWh (211) (215) (219) (261)	ergy n/year x x x + (262) -	cro-CHP		(230g) = Emiss kg CO: 0.2 0.5	ion fac 2/kWh 16	30 45 tor = =	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0 546.69 1183.17	(230c) (230e) (231) (232) Sar (261) (263) (264) (265)
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	ergy n/year	cro-CHP		(230g) = Emiss kg CO: 0.2	ion fac 2/kWh 16 19	30 45 tor = =	2946.67 2530.95 75 385.9 Emissions kg CO2/ye 636.48 0 546.69	(230c) (230e) (231) (232) Sar (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1422.37 (272)

TER = 22.63 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:47

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:**

Flat

Total Floor Area: 83.2m²

Dwelling Details:

NEW DWELLING DESIGN STAGE

2_02 - 2B4P Site Reference: **Tottenham Mews** Plot Reference:

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

22.17 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 8.73 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 32.7 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70) OK

Floor (no floor) Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

- 1		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	Oł
B Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	Oł
MVHR efficiency:	78%	
Minimum	70%	OF
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	Oł
ased on:		
Overshading:	Average or unknown	
Windows facing: South East	3.3m²	
Windows facing: North East	6.34m²	
Windows facing: North East	7.29m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller	blind
	Closed 100% of daylight hours	
0 Key features		
Air permeablility	3.0 m ³ /m ² h	
Windows U-value	1.1 W/m²K	
Community heating, heat from electric heat pump		

Photovoltaic array

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	USGI^L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	F	Property	Address	2_02 -	2B4P				
Address: 1. Overall dwelling dime	oneione:								
1. Overall dwelling diffic	511310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	220.48	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	83.2	(4)			•		_
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	220.48	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x -	10 =	0	(7a)
Number of passive vents	3			Ē	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	x	40 =	0	(7c)
				_					
		_	 \	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		, a to (_/),	00		o (o) to	(1.0)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	1.25 for steel or timber frame or resent, use the value corresponding to			•	ruction			0	(11)
deducting areas of openi		o irie grea	ter wall are	a (aitei					
•	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15) (16)
	q50, expressed in cubic metro	es per ho					area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$	•	•	•				0.15	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere	ed		(20) – 1	10 075 v (4	10)1 –			4	(19)
Shelter factor	ting chalter feater		(20) = 1 - (21) = (18)		19)] =			0.7	(20)
Infiltration rate incorpora Infiltration rate modified to	•		(21) = (10	/ X (20) =				0.1	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	1 3		1			l	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (20a) (2	2)m : 4	_	-		-	-		-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
(ΣΣα)ΠΤ 1.21 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32		I 1.00	1.12	1.10	J	

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effe		_	rate for t	he appli	cable ca	se	-	-	-	-	_	0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fror	n Table 4h) =				66.3	(23
a) If balance	ed mech	anical ve	entilation	with he	at recove	ery (MV	HR) (24a	a)m = (22)	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
24a)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (I	ИV) (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)r			ntilation on the character of the charac	•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r			ole hous m = (22l	•					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= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(25
3. Heat losse	s and he	eat loss i	paramet	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Vindows Type	e 1				1.65	_x 1	/[1/(1.1)+	0.04] =	1.74				(27
Vindows Type	2				3.17	x1	/[1/(1.1)+	0.04] =	3.34				(27
Vindows Type	e 3				7.29	x1	/[1/(1.1)+	0.04] =	7.68				(2
Valls Type1	35		16.9	3	18.07	y X	0.2	= [3.61				(29
Valls Type2	15.4	4	0		15.4	X	0.19	= [2.85				(29
otal area of e	lements	, m²			50.4								(3
for windows and * include the area						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	n 3.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.3	(3:
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design asses: an be used inste				construct	ion are no	t known pi	ecisely the	e indicative	values of	TMP in Ta	able 1f		
hermal bridg				usina Ac	pendix l	<						7.56	(36
details of therma	`	,		• .	•							7.00	(0)
otal fabric he	at loss							(33) +	(36) =			31.86	(3
entilation hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	[
38)m= 22	21.81	21.62	20.66	20.47	19.52	19.52	19.33	19.9	20.47	20.85	21.24		(3
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
39)m= 53.86	53.67	53.48	52.53	52.34	51.38	51.38	51.19	51.76	52.34	52.72	53.1]	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.65	0.65	0.64	0.63	0.63	0.62	0.62	0.62	0.62	0.63	0.63	0.64		
									Average =	Sum(40) ₁ .	12 /12=	0.63	(40)
Number of day	<u> </u>	<u> </u>	· ·						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4.1)
(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 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		52		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.07		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								<u> - 15 </u>					
(44)m= 103.48	99.71	95.95	92.19	88.42	84.66	84.66	88.42	92.19	95.95	99.71	103.48		
	!	!	<u> </u>	ļ		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1128.82	(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 (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.45	134.21	138.49	120.74	115.85	99.97	92.64	106.31	107.57	125.37	136.85	148.61		
					()		h (40		Total = Su	m(45) ₁₁₂ =	= [1480.06	(45)
If instantaneous v	vater neati 1		of use (no	not water	storage),		· · ·) tO (61)			T 1		
(46)m= 23.02 Water storage	20.13	20.77	18.11	17.38	15	13.9	15.95	16.14	18.81	20.53	22.29		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(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):				2.	24		(48)
Temperature f	actor fro	m Table	2b							0	.6		(49)
Energy lost fro		•					(48) x (49)) =		1.	34		(50)
b) If manufactHot water stor			-										(51)
If community h	-			C Z (KVV	ii/iiti G/GC	iy <i>)</i>					0		(31)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	rstorage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								1.	34		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	t loss (ar	nnual) fro	om Table	<u>-</u> -							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	ter 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 ca	alculated	for each	month (61)m =	(60) ÷ 3	865 × (41)m						
(61)m= 0	0	0	0	0	0	O	0	0	0	0	0]	(61)
Total heat red	uired for	water he	eating ca	alculated	for ead	h month	(62)n	า = 0.85 ×	(45)m -	 ⊦ (46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 218.38	`	203.42	183.57	180.78	162.8	157.57	171.2		190.29	`	213.54]	(62)
Solar DHW input	: calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ente	r '0' if no sola	ar contrib	ution to wat	er heating)	ı	
(add addition	al lines if	FGHRS	and/or \	vwhrs	applies	s, see Ap	pendi	x G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	vater hea	ter					•	•		•	•		
(64)m= 218.38	192.85	203.42	183.57	180.78	162.8	157.57	171.2	23 170.41	190.29	199.68	213.54		
	•					•		Output from v	vater heat	er (annual)	112	2244.52	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	+ (61	l)m] + 0.8	x [(46)n	n + (57)m	+ (59)m	ı]	
(65)m= 102.96	91.54	97.99	90.41	90.46	83.51	82.74	87.2	9 86.03	93.63	95.77	101.35		(65)
include (57)m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwelli	ng or hot v	vater is	from com	munity h	neating	
5. Internal g	jains (see	e Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.0	04 126.04	126.04	126.04	126.04		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso se	e Table 5		•		•	
(67)m= 20.45	18.16	14.77	11.18	8.36	7.06	7.63	9.91	13.3	16.89	19.72	21.02		(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation l	_13 or L1	За), а	lso see Ta	able 5	•	•	•	
(68)m= 226	228.34	222.43	209.85	193.97	179.05	169.07	166.7	73 172.64	185.22	2 201.1	216.03	1	(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), alsc	see Table	e 5				
(69)m= 35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	1	(69)
Pumps and fa	ans gains	(Table 5	ia)							<u>'</u>		ı	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)						!		
(71)m= -100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.8	33 -100.83	-100.83	3 -100.83	-100.83	1	(71)
Water heating	g gains (T	able 5)										•	
(72)m= 138.39	136.22	131.71	125.57	121.59	115.98	111.21	117.3	32 119.49	125.84	133.01	136.23]	(72)
Total interna	l gains =	!			(66	6)m + (67)m	า + (68)	m + (69)m +	(70)m +	(71)m + (72)m	ı	
(73)m= 445.65	443.54	429.72	407.42	384.73	362.89	348.73	354.7	77 366.24	388.76	414.64	434.08]	(73)
6. Solar gair	ns:						1		1				
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions to	convert to t	he applic	able orienta	tion.		
Orientation:			Area			ux		_ g		FF		Gains	
	Table 6d		m²		Ta	able 6a		Table 6b)	Table 6c		(W)	
Northeast _{0.9x}	0.54	X	3.1	7	X	11.28] x [0.44	X	0.8	=	12.24	(75)
Northeast _{0.9x}	0.54	X	7.2	29	X	11.28] x	0.44	X	0.8	=	14.07	(75)
Northeast 0.9x	0.54	X	3.1	7	X	22.97	x	0.44	X	0.8	=	24.91	(75)
Northeast 0.9x	0.54	X	7.2	29	X	22.97] x [0.44	x	0.8	=	28.64	(75)
Northeast 0.9x	0.54	X	3.1	7	X	41.38	x	0.44	X	0.8	=	44.88	(75)

Northeast 0.9%	No. office and						7		_				—
Northeast 0.0x	Northeast _{0.9x}	0.54	7.	29	X	41.38	X	0.44	_ ×	0.8	_ =	51.6	(75)
Northeast 0.9x	<u> </u>	0.54	3.	17	X	67.96	X	0.44	×	0.8	=	73.7	(75)
Northeast 0.9x	<u> </u>	0.54	7.	29	X	67.96	X	0.44	×	0.8	=	84.75	(75)
Northeast 0.8x		0.54	3.	17	X	91.35	X	0.44	×	0.8	=	99.07	(75)
Northeast 0.sv	<u> </u>	0.54	7.	29	X	91.35	X	0.44	X	0.8	=	113.92	(75)
Northeast 0.5x	Northeast _{0.9x}	0.54	3.	17	X	97.38	X	0.44	X	0.8	=	105.62	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	7.	29	X	97.38	X	0.44	х	0.8	=	121.45	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	3.	17	X	91.1	X	0.44	x	0.8	=	98.81	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	7.	29	X	91.1	X	0.44	х	0.8	=	113.61	(75)
Northeast 0.9x	Northeast 0.9x	0.54	3.	17	X	72.63	X	0.44	X	0.8	=	78.77	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	72.63	X	0.44	x	0.8	=	90.57	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	3.	17	x	50.42	X	0.44	x	0.8	=	54.69	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	50.42	X	0.44	х	0.8	=	62.88	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	3.	17	x	28.07	x	0.44	x	0.8	=	30.44	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	28.07	X	0.44	x	0.8		35	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	3.	17	x	14.2	X	0.44	x	0.8	=	15.4	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	14.2	Īx	0.44	×	0.8	=	17.71	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	3.	17	x	9.21	i x	0.44	×	0.8	=	9.99	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	7.	29	x	9.21	Īx	0.44	×	0.8	_	11.49	(75)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	36.79	i x	0.44	×	0.8	=	20.77	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	62.67	i x	0.44	×	0.8	=	35.38	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	85.75	j ×	0.44	×	0.8		48.41	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	106.25	j ×	0.44	×	0.8	_	59.98	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	119.01	i x	0.44	×	0.8		67.19	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	118.15	d x	0.44	= x	0.8	=	66.7	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	113.91	×	0.44	x	0.8	=	64.31	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	104.39	X	0.44	x	0.8	=	58.93	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	92.85	d x	0.44	= x	0.8	=	52.42	(77)
Southeast 0.9x	Southeast 0.9x	0.54	1.	65	x	69.27	j ×	0.44	x	0.8	=	39.1	(77)
Southeast 0.9x					x		d x		x				=
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 47.08					x		d x		=		= =		=
(83)m= 47.08 88.93 144.89 218.44 280.18 293.77 276.73 228.28 169.98 104.55 57.98 39.26 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 492.73 532.47 574.62 625.86 664.91 656.67 625.45 583.05 536.23 493.31 472.62 473.34 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													` ′
(83)m= 47.08 88.93 144.89 218.44 280.18 293.77 276.73 228.28 169.98 104.55 57.98 39.26 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 492.73 532.47 574.62 625.86 664.91 656.67 625.45 583.05 536.23 493.31 472.62 473.34 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in wat	s. calculate	d for eac	h mont	h		(83)m	n = Sum(74)m .	(82)m				
(84)m= 492.73 532.47 574.62 625.86 664.91 656.67 625.45 583.05 536.23 493.31 472.62 473.34 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	T		1	1	$\overline{}$	93.77 276.73				57.98	39.26	1	(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Total gains – inter	nal and sola	ır (84)m	= (73)m	+ (B3)m , watts	'				l.	ı	
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 492.73 532	2.47 574.62	625.86	664.91	6	56.67 625.45	583	.05 536.23	493.31	472.62	473.34		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean internal	temperature	e (heating	g seaso	n)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature dur	ng heating	periods i	n the liv	/ing	area from Ta	ble 9	, Th1 (°C)				21	(85)
(86)m= 0.95 0.93 0.89 0.8 0.66 0.48 0.36 0.4 0.62 0.83 0.93 0.96 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation factor f	or gains for	living ar	ea, h1,r	n (s	ee Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		<u> </u>			Ť		A	ug Sep	Oct	Nov	Dec		
	(86)m= 0.95 0.	93 0.89	0.8	0.66	1	0.48 0.36	0.	4 0.62	0.83	0.93	0.96		(86)
	Mean internal ter	nperature ir	living ar	ea T1 (follo	w steps 3 to	7 in T	able 9c)		•	•	•	
		 		 		i	1	<u> </u>	20.65	20.23	19.86]	(87)
	<u> </u>			1		ļ	'	1	<u> </u>	1	I.	ı	

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 20.39 20.39 20.39 20.4 20.4 20.41 20.41 20.42 20.41 20.4 20.4 20.4		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.95 0.93 0.88 0.78 0.63 0.44 0.31 0.35 0.57 0.81 0.92 0.95		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.87 19.1 19.49 19.96 20.26 20.39 20.41 20.41 20.34 19.97 19.38 18.83		(90)
fLA = Living area ÷ (4) =	0.54	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_
(92)m= 19.42 19.61 19.94 20.34 20.59 20.7 20.73 20.72 20.66 20.34 19.84 19.39		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 19.42 19.61 19.94 20.34 20.59 20.7 20.73 20.72 20.66 20.34 19.84 19.39		(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= 0.94 0.92 0.87 0.78 0.64 0.46 0.34 0.37 0.59 0.81 0.91 0.94		(94)
Useful gains, hmGm , W = (94)m x (84)m		4
(95)m= 462.07 488.26 501.88 488.57 424.06 304.85 210.1 218.45 316.85 399.9 429.72 446.95		(95)
Monthly average external temperature from Table 8 (96)m=		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]		(50)
(97)m= 814.2 789.72 718.79 600.73 465.29 313.59 211.96 221.3 339.36 509.83 671.59 806.41		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 261.98 202.58 161.38 80.76 30.68 0 0 0 81.78 174.14 267.44		
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =	1260.74	(98)
Space heating requirement in kWh/m²/year	15.15	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		٦
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 standard of the	ne 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	1260.74	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1323.78	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
·		_

Space heating requirement from secon	darv/supplementarv systen	n (98) x (301) x 1	100 ÷ (308) =	0	(309)
	, ,, , , , , , , , , , , , , , , , , , ,	, ,		<u> </u>	_
Water heating Annual water heating requirement				2244.52	7
If DHW from community scheme:	_	(04) (2027)	(205) ;; (200)		_
Water heat from Community heat pump	0		$(305) \times (306) =$	2356.75	(310a)
Electricity used for heat distribution		0.01 × [(30/a)(30/	7e) + (310a)(310e)] =	36.81	(313)
Cooling System Energy Efficiency Ratio			l	0	(314)
Space cooling (if there is a fixed cooling	,	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dv mechanical ventilation - balanced, extra	<u> </u>	ıtside		161.39	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	ır	=(330a) + (330	(b) + (330g) =	161.39	(331)
Energy for lighting (calculated in Apper	ndix L)			361.13	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-631.51	(333)
Electricity generated by wind turbine (A	Appendix M) (negative quan	tity)		0	(334)
12b. CO2 Emissions – Community hea	ting scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and v		kWh/year		kg CO2/year	(367a)
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using to	kWh/year vo fuels repeat (363) to	kg CO2/kWh (366) for the second fuel	kg CO2/year	⊒` =
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using tw	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fuel	kg CO2/year	(367a) (367) (372)
Efficiency of heat source 1 (%)	If there is CHP using tv [(307b)+(31	kWh/year vo fuels repeat (363) to	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 =	250 764.08	⊒` =
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP using tw [(307b)+(31) [(337b)+(32) [(347b)+(32) [(347b)+(347b)+(347b) [(347b)+(347b)+(347b)+(347b) [(347b)+(347b)	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 =	250 764.08	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community	If there is CHP using tw [(307b)+(31) [(37b)+(31) [(37	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 3)(366) + (368)(373)	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 2) =	250 764.08 19.1 783.18	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	If there is CHP using tw [(307b)+(31) [(3*	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 3)(366) + (368)(373)	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	250 764.08 19.1 783.18	(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 source CO2 associated with space heating (see	If there is CHP using tw [(307b)+(31) [(37b)+(31) [(37	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 13)(366) + (368)(373) 19) x us heater (312) x 23) + (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	250 764.08 19.1 783.18 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 so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and water	If there is CHP using tw [(307b)+(31) [(37b) kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 13)(366) + (368)(373) 19) x us heater (312) x 23) + (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.52 = 0.52	250 764.08 19.1 783.18 0 0 783.18	(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 of the control of the community of the control of the community of the community of the control of the control of the community of the control of the con	If there is CHP using tw [(307b)+(31) [(37b)+(31) [(37	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 13)(366) + (368)(373) 19) x 2s heater (312) x 23) + (374) + (375) = (331)) x (22))) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 764.08 19.1 783.18 0 0 783.18 83.76	[(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 and co2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and with co2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies litem 1	If there is CHP using tw [(307b)+(31) [(37b)+(31) [(37	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 13)(366) + (368)(373) 19) x 2s heater (312) x 23) + (374) + (375) = (331)) x (22))) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 764.08 19.1 783.18 0 0 783.18 83.76 187.43	(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 of the community of the control of the co	If there is CHP using tw [(307b)+(31 [(37b)+(31) [(37b	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 13)(366) + (368)(373) 19) x 2s heater (312) x 23) + (374) + (375) = (331)) x (22))) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 764.08 19.1 783.18 0 0 783.18 83.76 187.43	(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 and co2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and with co2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies litem 1	If there is CHP using tw [(307b)+(31 [(37b)+(31) [(37b	kWh/year vo fuels repeat (363) to 0b)] x 100 ÷ (367b) x 13) x 13)(366) + (368)(373) 19) x 2s heater (312) x 23) + (374) + (375) = (331)) x (22))) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 764.08 19.1 783.18 0 0 783.18 83.76 187.43 -327.75 726.61	(367) (372) (373) (374) (375) (376) (378) (379) (380) (383)

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	— - 0 36FL	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.5.12	
A 1.1	į.	Property	Address	2_02 -	2B4P				
Address: 1. Overall dwelling dime	ensions:								
1. Overall aweiling aime	, , , , , , , , , , , , , , , , , , ,	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	220.48	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	83.2	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	220.48	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- +	0	j = F	0	x2	20 =	0	(6b)
Number of intermittent fa	ins			, <u> </u>	3	x ′	10 =	30	(7a)
Number of passive vents	3			F	0	x .	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$			į Ę	30		÷ (5) =	0.14	(8)
Number of storeys in t	peen carried out or is intended, proced he dwelling (ns)	ed to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)
Additional infiltration	ine arraining (ine)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding t	o the grea	ter wall are	a (after					
deducting areas of openi	ngs);).1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(000	July, 5.55					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)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.39	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	ea		(20) = 1 -	0.075 x (1	19)] =			0.7	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		,,			0.27	(21)
Infiltration rate modified t	•		, , ,					0.21	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7	•	<u>. </u>		•			•	
$(22)m = \begin{bmatrix} 5.1 & 5 \end{bmatrix}$	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (20-) (2	2)m : 4							-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
(ΣΣα)ΠΤ 1.21 1.20	1.20 1.1 1.00 0.95	1 0.33	1 0.32		1.00	1.12	1.10	J	

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.34	2
Calculate effective air change rate for the applicable case	<u> </u>
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0 (23b)
	0 (23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) $(24a)m = (22b)m + (23b) \times [1 - (24a)m = 0 $	3c) ÷ 100] (24a)
	(244)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0	(24b)
	(240)
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
(24c)m =	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.56 0.56 0.55 0.54 0.54 0.53 0.53 0.53 0.54 0.54 0.55 0.5	5 (24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.56 0.56 0.55 0.54 0.54 0.53 0.53 0.53 0.54 0.54 0.55 0.5	5 (25)
3. Heat losses and heat loss parameter:	
·	alue A X k
	n²-K kJ/K
Windows Type 1 1.65 $x^{1/[1/(1.4) + 0.04]} = 2.19$	(27)
Windows Type 2 $3.17 x^{1/[1/(1.4) + 0.04]} = 4.2$	(27)
Windows Type 3 7.29 $x^{1/[1/(1.4) + 0.04]} = 9.66$	(27)
Walls Type1 35 16.93 18.07 x 0.18 = 3.25	(29)
Walls Type2 15.4 0 15.4 x 0.18 = 2.77	(29)
Total area of elements, m ² 50.4	(31)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in parag	
** include the areas on both sides of internal walls and partitions	
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$	28.47 (33)
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e)	= 0 (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 1.	
· · ·	
can be used instead of a detailed calculation.	2.52 (36)
can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K	2.52 (36)
can be used instead of a detailed calculation.	2.52 (36) 30.99 (37)
can 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)	
can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) =	30.99 (37)
can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5)	30.99 (37)
can be used instead of a detailed calculation. Thermal bridges: $S(L \times Y)$ calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D	30.99 (37)
Can 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) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D (38)m = 40.7 40.53 40.37 39.59 39.45 38.78 38.78 38.65 39.04 39.45 39.74 40.58	30.99 (37) 9C 5 (38)

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.86	0.86	0.86	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.85	0.85		
					Į.	Į.	Į.	,	Average =	Sum(40) ₁ .	12 /12=	0.85	(40)
Number of day	s in mo	nth (Tabl	le 1a)		·	·	ı			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 heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	nancy	N									<u></u>		(42)
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.		52		(42)
Annual averag											.07		(43)
Reduce the annua not more that 125							to achieve	a water us	se target o	f			
								_					
Jan	Feb	Mar	Apr	May	Jun	Jul Table 10 V	Aug	Sep	Oct	Nov	Dec		
Hot water usage in											1		
(44)m= 103.48	99.71	95.95	92.19	88.42	84.66	84.66	88.42	92.19	95.95	99.71	103.48		– ,
Energy content of	hot water	used - cal	culated mi	anthly – 4	190 x Vd r	пуптуГ	Tm / 3600			m(44) ₁₁₂ = ables 1b 1	L	1128.82	(44)
(45)m= 153.45	134.21	138.49	120.74	115.85	99.97	92.64	106.31	107.57	125.37	136.85	148.61	1 100 00	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar = Su	m(45) ₁₁₂ =	= [1480.06	(43)
(46)m= 23.02	20.13	20.77	18.11	17.38	15	13.9	15.95	16.14	18.81	20.53	22.29		(46)
Water storage		20.77	10.11	17.00	10	10.0	10.00	10.14	10.01	20.00	22.20		(10)
Storage volum	e (litres)	includin	g 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	velling, 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.	65		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	89		(50)
b) If manufact Hot water stora			-										(51)
If community h	•			C Z (KVVI	ii/iiti e/ae	(y)					0		(31)
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.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contains												ix H	, ,
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	e 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 loog o	alaulata d	for cook	manth ((64)m	(60) · 2(GE (41	١,,,,						
Combi loss ca	0 0	Tor each	0	0	00) + 3	05 × (41)	0	0	0	0	0	1	(61)
	<u>ļ</u>							<u> </u>	<u> </u>	<u> </u>] · (59)m + (61)m	(01)
(62)m= 204.38	`	189.42	170.02	166.78	149.26	143.57	157.23	156.86	176.29	186.13	199.54	(59)111 + (61)111	(62)
Solar DHW input		l .		<u> </u>		<u> </u>						1	(02)
(add additiona									ii ooniiibai	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from v	vater hea	ıter		<u> </u>		<u> </u>	l	<u> </u>	<u>!</u>	ļ		ı	
(64)m= 204.38		189.42	170.02	166.78	149.26	143.57	157.23	156.86	176.29	186.13	199.54]	
						•	Out	put from w	ater heate	r (annual) ₁	12	2079.68	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 91.76	81.42	86.79	79.57	79.26	72.67	71.54	76.09	75.2	82.43	84.93	90.15	1	(65)
include (57)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	e Table 5	and 5a):									
Metabolic gai	ns (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04	126.04		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-		•	
(67)m= 20.91	18.57	15.11	11.44	8.55	7.22	7.8	10.14	13.61	17.28	20.16	21.49]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	_	-	•	
(68)m= 226	228.34	222.43	209.85	193.97	179.05	169.07	166.73	172.64	185.22	201.1	216.03		(68)
Cooking gains	s (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5	-	-	•	
(69)m= 35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6	35.6]	(69)
Pumps and fa	ans gains	(Table 5	āa)									_	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	on (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83	-100.83		(71)
Water heating	g gains (1	Table 5)										_	
(72)m= 123.34	121.16	116.65	110.52	106.54	100.93	96.16	102.27	104.44	110.79	117.96	121.17]	(72)
Total interna	l gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m 	_	
(73)m= 434.06	431.89	418	395.62	372.87	351	336.84	342.94	354.49	377.09	403.03	422.51		(73)
6. Solar gair													
Solar gains are		ŭ					itions to c		ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a	7	g_ able 6b	т	FF able 6c		Gains (W)	
							, —				_		1,
Northeast 0.9x	0.54		3.1			11.28	X	0.63		0.7	_ =	15.33	(75)
Northeast 0.9x			7.2			11.28	X	0.63		0.7	_ =	17.63	(75)
Northeast 0.9x	0.0 .	_	3.1			22.97	X	0.63		0.7	_ =	31.21	(75)
Northeast 0.9x		_	7.2		-	22.97	X	0.63		0.7	=	35.88	(75)
Northeast 0.9x	0.54	X	3.1	7	X	11.38	X	0.63	x	0.7	=	56.23	(75)

Northeast 0.98	Northeast _{0.9x}	0.54	×	7 '	29	x	1	1.38] x		0.63	7 x	0.7		\Box	64.65	(75)
Northeast 0.9x	<u> </u>		_						1			╡╏		=	⊨		=
Northeast 0.9x	<u>L</u>] 1			╡		=	\vdash		╡` ′
Northeast 0.9x	Northeast _{0.9x}		×			x]] x			ا × ا		╡ -	H		= ` '
Northeast 0.9x	Northeast _{0.9x}		×			x)] x			×	0.7	╡ -	F		(75)
Northeast 0.0x	Northeast _{0.9x}		x			x	_) x		0.63	×	0.7	_ =			(75)
Northeast 0.9x	Northeast 0.9x	0.54	x			x	9	7.38) x		0.63	×	0.7				(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	×	3.	17	x		91.1	X		0.63	×	0.7	-	F	123.79	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	x	7.2	29	x	9	91.1	x		0.63	×	0.7	-		142.34	(75)
Northeast 0.9x	Northeast 0.9x	0.54	x	3.	17	x	7	2.63	x		0.63	x	0.7	_ =		98.69	(75)
Northeast 0,9x	Northeast _{0.9x}	0.54	x	7.2	29	x	7	2.63	x		0.63	x	0.7		F	113.47	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	3.	17	x	5	0.42	x		0.63	x	0.7		Ī	68.51	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	5	0.42	x		0.63	x	0.7	<u> </u>	F	78.78	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	3.	17	x	2	8.07	x		0.63	x	0.7	<u> </u>	Ī	38.14	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	2	8.07	x		0.63	x	0.7	<u> </u>		43.85	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	3.	17	x	1	14.2	x		0.63	x	0.7	<u> </u>	T	19.29	(75)
Northeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	1	14.2	x		0.63	x	0.7	-		22.18	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	X	3.	17	x	9	9.21	x		0.63	x	0.7			12.52	(75)
Southeast 0.9x	Northeast _{0.9x}	0.54	x	7.2	29	x	9	9.21	x		0.63	x	0.7			14.4	(75)
Southeast 0,9x	Southeast 0.9x	0.54	x	1.6	65	x	3	6.79	x		0.63	x	0.7	=		26.02	(77)
Southeast 0.9x	Southeast 0.9x	0.54	x	1.6	65	x	6	2.67	X		0.63	x	0.7	=		44.33	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	8	5.75	x		0.63	x	0.7	=		60.65	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	10	06.25	x		0.63	x	0.7	=		75.15	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	11	19.01	X		0.63	x	0.7	=		84.17	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	11	18.15	X		0.63	x	0.7	=		83.56	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	11	13.91	X		0.63	x	0.7	=		80.57	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	10	04.39	X		0.63	x	0.7	=		73.83	(77)
Southeast 0.9x	Southeast 0.9x	0.54	X	1.6	65	x	9	2.85	X		0.63	x	0.7	=		65.67	(77)
Southeast 0.9x 0.54 x 1.65 x 31.49 x 0.63 x 0.7 = 22.27 (77) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Southeast 0.9x	0.54	X	1.6	65	x	6	9.27	X		0.63	x	0.7	=		48.99	(77)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m 1	Southeast 0.9x	0.54	X	1.6	65	x	4	4.07	X		0.63	x	0.7	=		31.17	(77)
(83)m= 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Southeast 0.9x	0.54	X	1.6	65	x	3	1.49	X		0.63	x	0.7	=		22.27	(77)
(83)m= 58.98 111.42 181.53 273.67 351.02 368.05 346.7 286 212.96 130.98 72.64 49.19 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)																	
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	1			1						\neg			1		_		(00)
(84)m= 493.04 543.31 599.53 669.28 723.89 719.05 683.54 628.94 567.46 508.08 475.67 471.69 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)									28	6	212.96	130.98	72.64	49.19			(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		-		· · ·		_			620	04	567.46	509 O	175.67	471.60	П		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	` ′						19.05	003.34	020	.94	307.40	506.00	475.67	471.09			(04)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				`				Tab	-1- 0	TL 2	L (0 0)				_		7(05)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	•	_	٠.			_			oie 9	, ih'	i (°C)				L	21	(85)
(86)m= 1 1 0.99 0.95 0.82 0.61 0.45 0.51 0.79 0.97 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		Ť				Ť				<u>.</u> T	S02	Oat	Nov	Doo	٦		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)				<u> </u>		+			_				+	-	\dashv		(86)
		<u> </u>			<u> </u>						!	0.91	1 '	L'	┙		(30)
(01)111= 20.10 20.21 20.41 20.14 20.93 20.99 21 21 20.90 20.11 20.39 20.14					1	`						20.74	20.20	20.44	٦		(87)
	(07)111= 20.16	20.27	∠∪.4/	20.74	20.93		20.99	21	1 2	<u>'</u>	∠∪.96	∠0./1	20.39	20.14			(01)

T		المارية				ali i i a III a ai	. f T.	.b.a. T	LO (0 0)					
· · · · · ·			eating p				1	i	· ` ´	20.24	20.24	20.24		(88)
(88)m=	20.2	20.2	20.2	20.21	20.21	20.22	20.22	20.22	20.22	20.21	20.21	20.21		(00)
г	tion fac	<u>_</u>	ains for i			```		9a)				· · · · · ·		
(89)m=	1	0.99	0.98	0.93	0.77	0.54	0.37	0.42	0.72	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)				
(90)m=	19.07	19.23	19.52	19.9	20.14	20.21	20.22	20.22	20.18	19.88	19.41	19.04		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.54	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.66	19.8	20.04	20.35	20.57	20.63	20.64	20.64	20.6	20.33	19.94	19.63		(92)
Apply	adjustn	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.66	19.8	20.04	20.35	20.57	20.63	20.64	20.64	20.6	20.33	19.94	19.63		(93)
8. Spa	ace hea	ting requ	uirement											
				•		ed at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
tne uti		Feb	or gains Mar			ميرا	Jul	۸۰۰۰	Con	Oct	Nov	Doo		
_ L Itilica:	Jan		ains, hm	Apr	May	Jun	Jui	Aug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.98	0.93	0.79	0.58	0.41	0.47	0.76	0.96	0.99	1		(94)
L	•		, W = (9 ⁴			0.00]	J	00	0.00	0.00			(- /
	491.41	539.68	588.45	624.26	575.15	415.56	281.42	294.21	428.7	486.84	472.14	470.5		(95)
` ' L		age exte	rnal tem	perature	from Ta	ı able 8		<u> </u>	<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 lo	oss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1101.07	1065.35	965.95	808.45	624.53	420.98	281.94	295.34	455.3	685.35	908.4	1096.45		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	453.58	353.25	280.86	132.62	36.74	0	0	0	0	147.69	314.1	465.71		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2184.56	(98)
Space	heatin	g require	ement in	kWh/m²	/year								26.26	(99)
9a. Ene	ergy rec	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatir	ng:												
Fraction	on of sp	ace hea	at from se	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)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ncy of ı	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ncy of	seconda	ry/supple	ementar	y heatin	g systen	า, %						0	(208)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊸ ear
Space	heatin	g require	ement (c		d above)							•	
	453.58	353.25	280.86	132.62	36.74	0	0	0	0	147.69	314.1	465.71		
(211)m	= {[(98)m x (20	(4)] } x 1	00 ÷ (20	16)									(211)
	485.11	377.81	300.38	141.84	39.29	0	0	0	0	157.96	335.94	498.09		
-				•		•	•	Tota	I (kWh/yea	ar) =Sum(2	211),15,1012	F	2336.42	(211)
		a fuel (s	econdar	y), kWh/	month							!		_
Space	heatin	9 . 5. 5. (5		. , .										
•		•	00 ÷ (20	• , .				r		i		· · · · · ·		
•		•		• , .	0	0	0	0	0	0	0	0		_
= {[(98)	m x (20)1)] } x 1	00 ÷ (20	8)		0	0		0 Il (kWh/yea				0	(215)

Output from water heater (calculated above) 204.38 180.21 189.42 170.02 166.78 14	49.26 143.57	157.23	156.86	176.29	186.13	199.54		
Efficiency of water heater	49.20 143.37	137.23	130.00	170.29	100.13	199.54	79.8	(21
· · · · · · · · · · · · · · · · · · ·	79.8 79.8	79.8	79.8	84.35	86.2	87	79.0	' ^د '[21)
Fuel for water heating, kWh/month	70.0	7 0.0	7 0.0	0 1.00	00.2	<u> </u>		(-
219)m = (64)m x 100 ÷ (217)m								
219)m= 235.24 208.14 220.61 202.02 204.54 1	87.04 179.91	197.03	196.56	209.01	215.93	229.35		,
		Total	= Sum(2				2485.38	(2
Annual totals				k\	Wh/year	r I	kWh/year	1
Space heating fuel used, main system 1							2336.42]
Vater heating fuel used							2485.38	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
otal electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(2
Electricity for lighting						ĺ	369.33	(2:
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO	2/kWh		kg CO2/yea	r
	ittiin y cai				40	= [504.67	(26
Space heating (main system 1)	(211) x			0.2	16	_	00	
Space heating (main system 1) Space heating (secondary)	•			0.2		= [0	(20
	(211) x				19	l I](26
Space heating (secondary) Vater heating	(211) x (215) x	+ (263) + (2	264) =	0.5	19	=	0	
Space heating (secondary) Vater heating Space and water heating	(211) x (215) x (219) x	+ (263) + (2	264) =	0.5	19	=	0 536.84](2)
Space heating (secondary)	(211) x (215) x (219) x (261) + (262)	+ (263) + (2	264) =	0.5	19 16 19	= [0 536.84 1041.51](2(

TER =

22.17

(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:46

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Total Floor Area: 76m2

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference: **Tottenham Mews** Plot Reference: 2_03 - 2B4P

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

23.65 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 9.81 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.4 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.19 (max. 0.30) 0.20 (max. 0.70) OK

Floor (no floor) Roof

(no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Law anarmy lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	OK
MVHR efficiency:	78%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:	-	
Overshading:	Average or unknown	
Windows facing: North East	12.68m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller b	lind
6, 64.16.	Closed 100% of daylight hours	
	crossa ree/s or daying in ricure	
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from electric heat pump	·	
Photovoltaic array		
i notovoltalo urray		

		l Iser-I	Details:						
Assessor Name:	Vitaliy Troyan	USGI^L	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	į	Property	Address	2_03 -	2B4P				
Address: 1. Overall dwelling dime	pnoiono:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Ground floor				(1a) x		2.65	(2a) =	201.4	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	76	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	201.4	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	_ + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins			Γ	0	x '	10 =	0	(7a)
Number of passive vents	3			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_			A in a b	anges ner h	
	ve flues and force (60) (6b) (7a) ı (7b) ı	(70) -	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		(//				,		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	1.25 for steel or timber frame or resent, use the value corresponding to the corresponding			•	ruction			0	(11)
deducting areas of openi		o ine grea	ter wan are	a (anter					
•	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metr	es per ho					area	3	(17)
,	lity value, then $(18) = [(17) \div 20] +$	•	•	•		о.оро	u. • u	0.15	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere	ed		(20) 4	10 07E v (4	10)1			4	(19)
Shelter factor	ting aboltor factor		(20) = 1 - (21) = (18)		19)] =			0.7	(20)
Infiltration rate incorporation	•		(21) = (10) X (20) =				0.1	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		1 00	1 7.59			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]	
Wind Foster (00s) : (2	2)		•		•	•		•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32	'	1.00	1.12	1.10	J	

0.13	ation rate	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effe		•	ate for t	he appli	cable ca	se	ļ				ļ	I	
If mechanica				(22			.=	. (22)	\ (00 \			0.5	(23
If exhaust air h) = (23a)			0.5	(23
If balanced with		•	•	ŭ		,						66.3	(2:
a) If balance						<u> </u>		<u> </u>			` ` ´	÷ 100] I	(0
24a)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(2
b) If balance						· ·	- ^ ` `	, ,	r i	•		1	(0
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (22h	`			
	n < 0.5 × ((23b), ti	nen (240	0 = (230	o); otnerv	vise (24)	C) = (220)	0) m + 0.	5 × (230	0	0]	(2
									U		U		(2
d) If natural if (22b)n	ventilation n = 1, ther			•	•				0.5]				
24d)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)			ļ.	l	
25)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(2
3. Heat losse	_	·			NI-1 A-		11 -1	_	A 37 11		1 -1		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
LEMENT	Gross area (r		Openin m	=	Net Ar A ,n		U-valı W/m2		A X U (W/ł	()	k-value kJ/m²-l		XXk J/K
Vindows		,			3.17		/[1/(1.1)+		3.34	$\stackrel{\prime}{\Box}$			(2
Valls Type1	36.3	\neg	12.68	$\overline{}$	23.62	=	0.2		4.72	=) (2
Valls Type2	24.1	=	0		24.1	X	0.19	<u> </u>	4.46	=		╡┝	` (2
otal area of e		 m²			60.4	╡ ^	0.19		4.40				\^2 (3
for windows and	•		ffective wi	ndow I I-va		 ated usino	ı formula 1	/[(1/ -valı	ıe)±0 041 a	s aiven in	naragranh	1 3 2	(-
include the area						atou uomg	Torrida 1	I(170 vale	10) 10.0 1 ₁ u	o givoii iii	paragrapi	10.2	
abric heat los	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				22.55	(3
leat capacity	Cm = S(A)	xk)							(30) + (32)	!) + (32a).	(32e) =	0	(3
. ,								((28)	(00) 1 (02	, , ,			100
	paramete	r (TMF	e Cm ÷	- TFA) in	ı kJ/m²K			** **	tive Value:	, , ,		100	=
hermal mass for design assess	sments where	e the det	tails of the	,			ecisely the	Indica	tive Value:	Low	able 1f	100	=
Thermal mass for design assess an be used inste	sments where ad of a detail	re the det iled calcu	tails of the ılation.	constructi	ion are not	known pr	ecisely the	Indica	tive Value:	Low	able 1f		(3
Thermal mass for design assess an be used inste Thermal bridge	sments where ad of a detail es : S (L x	re the det iled calcu Y) calc	tails of the ilation. culated t	constructi	on are not pendix l	known pr	ecisely the	Indica	tive Value:	Low	able 1f	9.06	(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal	sments where ead of a detail es:S(L x al bridging ar	re the det iled calcu Y) calc	tails of the ilation. culated t	constructi	on are not pendix l	known pr	ecisely the	Indica indicative	tive Value:	Low	able 1f	9.06	(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal Total fabric he	sments when ad of a detail es: S (L x al bridging ar at loss	re the det iled calcu Y) calcure re not kno	tails of the ulation. culated u	constructiusing Ap	on are not pendix l	known pr	ecisely the	Indicative (33) +	tive Value: e values of (36) =	Low TMP in Ta			(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal fotal fabric hermal details of thermal fotal fabric hermal design and the second design as the	sments when ead of a detail es: S (L x al bridging ar eat loss at loss cald	re the det iled calcu Y) calcu re not kno	tails of the ulation. culated u own (36) = monthly	constructi	on are not pendix h	known pr	,	Indicative (33) + (38)m	tive Value: e values of (36) = = 0.33 × (30)	Low TMP in Ta		9.06	(3
hermal mass or design assess an be used inste hermal bridge details of thermal otal fabric hermal fa	sments when add of a detail es : S (L x all bridging areat loss at loss call	re the det iled calcu Y) calcu re not kno culated Mar	tails of the ulation. culated u own (36) = monthly	constructions constructions constructions constructions constructions constructed constructions cons	pendix h	known pr	Aug	Indicative (33) + (38)m Sep	(36) = = 0.33 × (30)	Low TMP in Te		9.06	
Thermal mass for design assess an be used inste Thermal bridge details of thermal total fabric here. Thermal bridge details of thermal total fabric here. Thermal bridge details of thermal total fabric here. Thermal mass are used in the second properties.	esments when ad of a detail es : S (L x al bridging are at loss at loss calc Feb	re the det illed calcu Y) calcu re not know culated Mar	tails of the ulation. culated u own (36) = monthly	constructi	on are not pendix h	known pr	,	Indicative (33) + (38)m Sep 18.18	(36) = = 0.33 × (2) Oct 18.7	Low TMP in Te 25)m x (5) Nov 19.05	Dec	9.06	(3
Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric hermal dentilation head as many series and series are transfer of the design as	esments when and of a detail. es: S (L x all bridging are at loss calcombined by the second by the s	re the det illed calcu Y) calcu re not kno culated Mar 19.75	tails of the ulation. culated to own (36) = monthly Apr 18.88	constructions constructions constructions constructions constructed constructed constructions constructed constructed constructed constructions constructed	pendix k Jun 17.83	Jul	Aug 17.65	(33) + (38)m Sep 18.18 (39)m	(36) = = 0.33 × (37) = (37) + (37)	Low TMP in Ta 25)m x (5) Nov 19.05 88)m	Dec 19.4	9.06	(3
Thermal mass for design assess an be used inste Thermal bridge details of thermal fotal fabric he Ventilation hea	esments when and of a detail. es: S (L x all bridging are at loss calcombined by the second by the s	re the det illed calcu Y) calcu re not know culated Mar	tails of the ulation. culated u own (36) = monthly	constructions constructions constructions constructions constructions constructed constructions cons	pendix h	known pr	Aug	(33) + (38)m Sep 18.18 (39)m 49.78	(36) = = 0.33 × (37) +	25)m x (5) Nov 19.05 88)m 50.66	Dec 19.4 51.01	9.06	(3
Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric hermal details of thermal fotal fabric hermal details of thermal fabric hermal design and the design and the design and the design as t	sments when ad of a detail es: S (L x al bridging are eat loss cald Feb 19.92 coefficient,	the the detailed calculated Mar 19.75 , W/K 51.35	tails of the ulation. culated to own (36) = monthly Apr 18.88	constructions constructions constructions constructions constructed constructed constructions constructed constructed constructed constructions constructed	pendix k Jun 17.83	Jul	Aug 17.65	(33) + (38)m Sep 18.18 (39)m 49.78	(36) = = 0.33 × (37) = (37) + (37)	25)m x (5) Nov 19.05 88)m 50.66 Sum(39) ₁ .	Dec 19.4 51.01	9.06	(3
Thermal mass for design assess an be used instead of thermal bridge details of thermal fotal fabric hermal details of thermal fotal fabric hermal deat transfer of the details of thermal details of the	sments when ad of a detail es: S (L x al bridging are eat loss cald Feb 19.92 coefficient,	the the detailed calculated Mar 19.75 , W/K 51.35	tails of the ulation. culated to own (36) = monthly Apr 18.88	constructions constructions constructions constructions constructed constructed constructions constructed constructed constructed constructions constructed	pendix k Jun 17.83	Jul	Aug 17.65	(33) + (38)m Sep 18.18 (39)m 49.78	(36) = = 0.33 × (2) Oct 18.7 = (37) + (3) 50.31 Average =	25)m x (5) Nov 19.05 88)m 50.66 Sum(39) ₁ .	Dec 19.4 51.01	9.06	(3)

Number of days in month (Table 1a)

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)
			<u> </u>	<u> </u>							<u>. </u>			
1 \\/-	tor boot	ing once	ray roqui	iromont:								kWh/ye	oor:	
4. ۷۷	ilei ileai	ing ener	rgy requi	nement.								KVVII/yt	ear.	
Assum	ed occu	pancy, I	N								2.	38		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)		ı	
	A £ 13.9	•				\ / al		(OF v. NI)	. 20				I	(15)
								(25 x N) to achieve		se target o		.79		(43)
		-	person pei			-	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			l	<u> </u>		l	Table 1c x		Сор	00.	1101	200		
(44)m=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87		
(11)	00.07	00.20	02.0	00.07	00.01	1 0	01	1 00.01	l				1089.44	(44)
Total = Sum(44) ₁₁₂ = 10 Energy content of hot water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 \text{ kWh/month}$ (see Tables 1b, 1c, 1d)												1003.44		
(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42		
(10)=	1 10.1	120.00	100.00	110.00	111.01	00.10	00.11	102.0			m(45) ₁₁₂ =		1428.42	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		rotar – oa	111(40)112 -	ļ	1420.42	
(46)m=	22.21	19.43	20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51		(46)
, ,			20.00	17.10	10.77	L	10.11	10.00	10.07	10.10	10.01	21.01		(- /
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 200 (4													(47)	
If community heating and no tank in dwelling, enter 110 litres in (47)														
Otherv	Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)													
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWl	n/day):				2.	24		(48)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1.	34		(50)
b) If m	nanufact	urer's de	eclared o	cylinder l	loss fact	or is not	known:							
		-	factor fr		le 2 (kW	h/litre/da	ay))		(51)
	•	_	ee secti	on 4.3										
	e factor			Oh)		(52)
-			m Table)		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =)		(54)
	(50) or (, ,	,								1.	34		(55)
Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Drimon	oirouit	loop (on	hanal\ fra	m Table)		(58)
	•	•	nual) fro			50\m - /	(58) · 36	S5 ~ (/1)	m			<u> </u>		(00)
	Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)													
(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)
				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>						· -/
			i		ì	ì ´	65 × (41	<u></u>					1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for	water he	eating ca	alculated	I for ead	ch month	(62)r	n = 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 213.02 188.17	198.59	179.36	176.74	159.32	154.33	167.		185.92	194.91	208.35		(62)
Solar DHW input calculated	using App	endix G oı	· Appendix	: H (nega	tive quantity	/) (ente	er '0' if no sola	ar contribu	tion to wate	er heating)		
(add additional lines if	FGHRS	and/or \	WWHRS	applies	s, see Ap	pend	ix G)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water hea	ıter	•	•	•	•	•	•	•	•	•	'	
(64)m= 213.02 188.17	198.59	179.36	176.74	159.32	154.33	167.	52 166.65	185.92	194.91	208.35		
	!				•	(Output from w	ater heat	er (annual)	12	2192.88	(64)
Heat gains from water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	+ (6	1)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 101.18 89.98	89.12	82.35	81.67	86.0	5 84.79	92.17	94.18	99.63		(65)		
include (57)m in cal	culation (of (65)m	only if c	ylinder	is in the	dwelli	ng or hot v	vater is f	rom com	munity h	eating	
5. Internal gains (see Table 5 and 5a):												
Metabolic gains (Table 5), Watts												
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(66)m= 119.13 119.13	119.13	119.13	119.13	119.13	119.13	119.		119.13	119.13	119.13		(66)
Lighting gains (calcula	ted in Ar	pendix	L. eguat	ion L9 o	or L9a). a	lso se	ee Table 5	<u>!</u>			l	
(67)m= 19.77 17.56	14.28	10.81	8.08	6.82	7.37	9.5		16.33	19.06	20.32		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
(68)m= 210.88 213.07 207.55 195.81 180.99 167.07 157.76 155.57 161.09 172.83 187.65 201.57 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 (69)												(69)
Pumps and fans gains	ļ	ļ	001	0	1 0		1 0	1 001	1 0	0		,
(70)m =	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporation	l	l	l	l						Ŭ		(1-5)
(71)m= -95.3 -95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.	3 -95.3	-95.3	-95.3	-95.3	1	(71)
` '	ļ	00.0	00.0	00.0	1 00.0		0 00.0	00.0	1 00.0	55.5		(* -)
Water heating gains (7 (72)m= 136 133.9	•	122.62	110.70	114.37	109.77	115.	66 117.76	123.89	130.81	133.91		(72)
` '	!	123.03	119.70	<u> </u>)m + (69)m +					(12)
Total internal gains = (73)m= 425.38 423.26	410.12	388.99	367.6	347	333.64	339.	, ,	371.78	<u>, </u>	414.54		(73)
(73)m= 425.38 423.26 6. Solar gains:	410.12	300.99	307.0	347	333.04	339.	350.45	3/1./0	390.23	414.54		(73)
Solar gains are calculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions t	o convert to t	he applica	ble orientat	tion.		
Orientation: Access F	•	Area			JX		g_	по арриос	FF		Gains	
Table 6d		m ²			ble 6a		Table 6b	٦ ٦	able 6c		(W)	
Northeast 0.9x 0.54	x	3.1	7	x	11.28] _x [0.44	×	0.8		24.47	(75)
Northeast 0.9x 0.54		3.1			22.97) _X [0.44	x [0.8	=	49.82] (75)
Northeast 0.9x 0.54	_	3.1			41.38] 	0.44	-	0.8	=	89.76] (75)
Northeast 0.9x 0.54		3.1		-	67.96]	0.44	x [0.8	=	147.41] (75)
No with a part and					91.35]	0.44	x [0.8		198.15	(75)
Northeast 0.9x 0.54			97.38]	0.44		0.8		211.25	(75)		
Northeast 0.9x 0.54	_	3.1		x	91.1] ^ [] _x [0.44	^ L	0.8		197.62](75)
Northeast 0.9x 0.54	_	3.1			72.63] ^	0.44	^ L	0.8		157.54](75)
0.54	^	J. 1	1	^	1 4.00	J ^ L	0.44	^ L	0.0		107.04	١٠٠٠)

Northea	st _{0.9x}	0.54	X	3.1	7	× 50.4		x	0.44	x	0.8	=	109.37	(75)
Northea	st _{0.9x}	0.54	х	3.1	7	x 28.		x	0.44	х	0.8	=	60.88	(75)
Northea	st _{0.9x}	0.54	x	3.1	7	х	14.2	X	0.44	х	0.8	=	30.8	(75)
Northea	st _{0.9x}	0.54	×	3.1	7	x	9.21	x	0.44	_ x [0.8	_ =	19.99	(75)
	_													_
Solar g	ains in	watts, ca	alculated	for eacl	h month			(83)m = 3	Sum(74)m .	(82)m				
(83)m=	24.47	49.82	89.76	147.41	198.15	211.	25 197.62	157.54	109.37	60.88	30.8	19.99		(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	F (83)	m , watts				!		1	
(84)m=	449.86	473.08	499.87	536.4	565.74	558.	24 531.26	497.1	459.82	432.66	427.04	434.53		(84)
7. Mea	an inter	nal temp	erature ((heating	season									
				`			ea from Tal	ole 9. Ti	ո1 (°C)				21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a)														
]	Jan	Feb	Mar	Apr	May	Ju		Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.96	0.94	0.91	0.84	0.71	0.54		0.44	0.67	0.86	0.93	0.96	1	(86)
` ′ L								<u> </u>	ļ				I	` '
Г							steps 3 to 7			l	l		1	(07)
(87)m=	19.78	19.92	20.19	20.55	20.81	20.9	20.99	20.98	20.89	20.57	20.14	19.76	J	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwell	ing from Ta	ble 9, 7	h2 (°C)	_		_	_	
(88)m=	20.36	20.36	20.36	20.37	20.37	20.3	38 20.38	20.39	20.38	20.37	20.37	20.37		(88)
Utilisa	tion fac	tor for g	ains for r	est of d	welling,	12,m	(see Table	9a)						
(89)m=	0.95	0.94	0.9	0.82	0.68	0.49	<u>` </u>	0.39	0.62	0.84	0.93	0.96]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)											ı			
(90)m=	18.7	18.9	19.29	19.8	20.16	20.3	<u> </u>	20.37	20.27	19.84	19.23	18.68	1	(90)
(00)			10.20				20.00				g area ÷ (4		0.57	(91)
												,	0.07	
Г							= fLA × T1				T		1	(00)
(92)m=	19.32	19.49	19.8	20.22	20.53	20.6		20.72	20.63	20.26	19.75	19.3	J	(92)
г			T T		· ·		from Table	i -	- 	·	T 40.75	1,00	1	(02)
(93)m=	19.32	19.49	19.8	20.22	20.53	20.6	9 20.73	20.72	20.63	20.26	19.75	19.3		(93)
		Ĭ.	uirement				-1441	Table 6	N	. T' /	70)			
			ernai ten or gains t			ea at	step 11 of	rables	ob, so tha	it 11,m=(76)m an	a re-caid	culate	
σ σ	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec	1	
L Utilisa			ains, hm	•	may		••		1 000		1101		ı	
(94)m=	0.94	0.93	0.89	0.82	0.69	0.5	1 0.38	0.42	0.64	0.83	0.92	0.95	1	(94)
Useful	gains,	hmGm .	W = (94	m x (84	4)m		<u> </u>	l	!	!	!	ļ	ı	
(95)m=	423.01	438	445.91	437.47	388.81	287.	47 200.75	208.17	293.82	361.2	391.12	410.94]	(95)
Month	ly avera	age exte	rnal tem	perature	from Ta	able 8	3	!		!		ļ.	ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	6 16.6	16.4	14.1	10.6	7.1	4.2	1	(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	_m , \	W =[(39)m	x [(93)n	n– (96)m]			1	
(97)m=	776.55	751.6	683.14	571.68	444.34	301.0	04 203.94	212.86	324.84	485.89	640.65	769.96		(97)
Space	heatin	g require	ement for	r each n	nonth, k\	Vh/m	onth = 0.02	24 x [(97	7)m – (95)m] x (4	1)m	•	'	
(98)m=	263.03	210.74	176.5	96.64	41.32	0	0	0	0	92.77	179.66	267.11		
_								Tot	al per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1327.76	(98)
Space	heatin	a reauire	ement in	kWh/m²	?/vear								17.47	(99)
.,		J 1,5		, ·	,									」 ` ′

9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab	·	0	(301)
Fraction of space heat from community system 1 – (301) =	Γ	1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		e 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	Γ	kWh/yea 1327.76	r
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1394.15	(307a)
Efficiency of secondary/supplementary heating system in % (from 1	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		2192.88	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2302.52	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	36.97	(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	side	147.42	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	147.42	(331)
Energy for lighting (calculated in Appendix L)		349.1	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-576.34	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor E kWh/year kg CO2/kWh kg	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 two	o fuels repeat (363) to (366) for the second fuel	250	(367a)
CO2 associated with heat source 1 [(307b)+(310	b)] x 100 ÷ (367b) x	767.43	(367)
Electrical energy for heat distribution [(313	3) x 0.52 =	19.19	(372)
Total CO2 associated with community systems (363)(366) + (368)(372) =	786.62	(373)
CO2 associated with space heating (secondary) (309) x 0 =	0	(374)

CO2 associated with water from imme	(312) x	0.52	=	0	(375)		
Total CO2 associated with space and	water heating	(373) + (374) + ((375) =			786.62	(376)
CO2 associated with electricity for pun	nps and fans within dw	elling (331)) x		0.52	=	76.51	(378)
CO2 associated with electricity for light	ting	(332))) x		0.52	=	181.18	(379)
Energy saving/generation technologies	s (333) to (334) as app	licable			. –		7
Item 1				0.52 x 0.0	J1 =	-299.12	(380)
Total CO2, kg/year	sum of (376)(382) =					745.19	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					9.81	(384)
El rating (section 14)						91.75	(385)

			User D	otoile:								
) (1) T		USEI L					OTDO	040000			
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 201	12		Strom: Softwa				STRO	on: 1.0.5.12			
Software Name.	Stroma i SAI 20		operty ,	Address				VCISIC	71. 1.0.5.12			
Address :												
1. Overall dwelling dime	ensions:											
Ground floor			Area	a(m²)	(4=)		ight(m)	7(0-)	Volume(m ³	<u>^</u>		
	\				(1a) x	2	.65	(2a) =	201.4	(3a)		
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n))	76	(4)					_		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	201.4	(5)		
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır		
N. selven of all leaves a	heating	neating	, –		, –			40		_		
Number of chimneys	0 +	0]	0] = [0		40 =	0	(6a)		
Number of open flues	0 +	0] + L	0] = [0		20 =	0	(6b)		
Number of intermittent fa					L	3	X '	10 =	30	(7a)		
Number of passive vents	;				L	0	X '	10 =	0	(7b)		
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)		
Air changes per hour												
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $30 $												
If a pressurisation test has b	•				ontinue fr			- (0) =	0.15	(0)		
Number of storeys in the	he dwelling (ns)								0	(9)		
Additional infiltration							[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0	0.25 for steel or timber present, use the value corres				•	ruction			0	(11)		
deducting areas of openi		sponding to	ine great	er wan are	a (anter							
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.1	1 (seale	ed), else	enter 0				0	(12)		
If no draught lobby, en									0	(13)		
Percentage of window	s and doors draught s	tripped							0	(14)		
Window infiltration				0.25 - [0.2	, ,	_	. (45)		0	(15)		
Infiltration rate	250 summara dia sul	-:		(8) + (10)	, , ,	, , ,	, ,		0	(16)		
Air permeability value, If based on air permeabil	•		•	•	•	etre or e	rivelope	area	5	(17)		
Air permeability value applie	-					is beina u	sed		0.4	(18)		
Number of sides sheltere				, ,	,	3			4	(19)		
Shelter factor				(20) = 1 -	0.075 x (1	l9)] =			0.7	(20)		
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.28	(21)		
Infiltration rate modified f	or monthly wind speed	d							_			
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 $(22a)m = (22)m \div 4$												
<u> </u>	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18				
							-		ı			

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.31	0.33		
Calculate effe		-	rate for t	he appli	cable ca	se	•		•		•		 .
If mechanic			andiv N. (2	2h) _ (22c	a) Em. /	auation (VEVV otho	auioo (22h	v) = (33a)			0	(23
If exhaust air h		0		, ,	,	. ,	,, .	,	o) = (23a)			0	(23
If balanced with		•	•	ŭ		`		'	0 1.) (1		. (00.)	0	(23
a) If balance	1	i	1		i	- 	- 	<u> </u>	 		' ' '	i ÷ 100] I	(0.4
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance						, 	, 		, 		ı	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				5 (00)	`			
		· /·	<u> </u>	ŕ	ŕ	<u> </u>	´`	<u> </u>	.5 × (23b		Ι .	1	(0.4
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation m = 1, the			•	•				0.5]				
(24d)m= 0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(24
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	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(25
2 Heat lease	o and be	ot loss i	o o rom ot	0.51	•		•		•		•	•	
3. Heat losse	_	·			Not Am		اميدا		A V I I		المراجع الما		A V I.
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/l	<)	k-value kJ/m²-		A X k kJ/K
Windows					3.17	x1	/[1/(1.4)+	0.04] =	4.2				(27
Walls Type1	36.3	3	12.68	В	23.62	<u>x</u>	0.18	=	4.25				(29
Walls Type2	24.	1	0		24.1	X	0.18	=	4.34			\neg	(29
Total area of e	elements	, m²			60.4								(31
* for windows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ue)+0.04] a	s given in	paragraph	1 3.2	
** include the are				ls and par	titions								
Fabric heat lo	·	•	U)				(26)(30)	+ (32) =				25.4	(33
Heat capacity	Cm = S($(A \times k)$						((28).	(30) + (32	?) + (32a).	(32e) =	0	(34
Thermal mass	parame	ter (TMF	² = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35
For design asses				construct	ion are no	t known pr	recisely the	indicative	e values of	TMP in T	able 1f		
can be used inste Thermal bridg				icina Ar	nondiy l							0.00	
if details of therm	,	,		• .	•	`						3.02	(36
Total fabric he		are not an	01111 (00) =	- 0.00 x (0	17			(33) +	- (36) =			28.42	(37
Ventilation hea	at loss ca	alculatec	d monthly	/				(38)m	$i = 0.33 \times ($	25)m x (5)		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 37.44	37.28	37.12	36.37	36.23	35.57	35.57	35.45	35.82	36.23	36.51	36.81		(38
Heat transfer	l								ļ.			J	`
	65.7	65.54	64.79	64.65	63.99	63.99	63.87	64.24	64.65	64.93	65.23]	
		00.04	04.79	04.00	L 03.99	03.99	03.67	04.24			<u> </u>	0.1-0	
									Averses -	Sum/20/	/12_	67.70	1/30
		· ·LP), W/	/m²K						Average = ı = (39)m ÷		12 /12=	64.79	(39
(39)m= 65.86		HLP), W/	/m²K 0.85	0.85	0.84	0.84	0.84		_		0.86	64.79	(39

Number of days in month (Table 1a)

Numbe	er or day	s in mor	ıın (Tab	ie ra)		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)
						•	•	•					1	
4 \\/\	tor boot	ing oner	av roqui	romont:								kWh/ye	oor:	
4. 000	ilei ileai	ing ener	gy requi	rement.								KVVII/yt	sai.	
Assum	ed occu	pancy, I	N								2.	38		(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
	A £ 13.9	-						(O.5. N.I)	00				•	
								(25 x N)	+ 36 a water us	se target o		.79		(43)
		_	person per			_	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate						l .	Table 1c x		J Sep	Oct	NOV	Dec		
								·	00.07	00.0	00.00	00.07	1	
(44)m=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87		7,,,,
Total = Sum(44) ₁₁₂ = Energy content of hot water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 \times Wh/month$ (see Tables 1b, 1c, 1d)												1089.44	(44)	
													1	
(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42		7(45)
If instant	taneous w	ater heatii	na at point	of use (no	hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1428.42	(45)
			,	,		, , , , , , , , , , , , , , , , , , ,	1	· ·	,	10.15	10.01	04.54	1	(46)
(46)m= Water	22.21 storage	19.43	20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51		(46)
	•		includin	na anv so	olar or W	/WHRS	storage	within sa	ame ves	ടല		150	I	(47)
_		, ,					_		ATTIC VCG.	001		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)													
	storage		not wate	i (uno n	iciuues i	iistaiitai	ieous cc	ווטט וטווות	ers) erite	51 0 111 (47)			
	•		eclared l	oss facto	or is kno	wn (kWł	n/dav):				1	65		(48)
,			m Table			(.,, , .							(49)
•								(40) (40)				54		
• • • • • • • • • • • • • • • • • • • •			storage eclared o	-		or is not	known:	(48) x (49)) =		0.	89		(50)
			factor fr									0		(51)
			ee secti		- (3,							(0.7)
	e factor	_										0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
٠.	(50) or (•							·	-	89		(55)
	. , ,	, ,	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66	I	(56)
` '									7)m = (56)				 iv H	(30)
ii cyiii ide	- Contains	dedicated	30181 310	rage, (37)	11 = (30)111	X [(30) – (· · · · · · · · · · · · · · · · · · ·	o), eise (5	<i>i</i>	iii wiieie (1111) 13 110	пі Аррепа	I	
(57)m=	27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
Primar	y circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				•	
(mod	(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	ادم وورا	culated	for each	month /	(61)m –	(60) ÷ 30	65 × (41)m	•	•			•	
(61)m=	0	0	0	0	0	00) + 30	0	0	0	0	0	0		(61)
(01)111=		U	U	U			L		L		U	Ŭ		(01)

Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$													
(62)m= 199.02 175.52	184.59	165.81	162.74	14	5.77 140.33	153	.52	153.1	171.92	181.36	194.35		(62)
Solar DHW input calculated us	sing Appe	endix G or	Appendix	H (ı	negative quantity) (ent	er '0' if	f no solar	contribu	tion to wate	er heating)		
(add additional lines if Fe	GHRS a	and/or V	VWHRS	ар	plies, see Ap	pend	lix G))				_	
(63)m= 0 0	0	0	0		0 0	0		0	0	0	0		(63)
Output from water heate	er:												
(64)m= 199.02 175.52	184.59	165.81	162.74	14	5.77 140.33	153	.52	153.1	171.92	181.36	194.35		
	-						Outpu	t from wa	iter heate	er (annual) ₁	12	2028.04	(64)
Heat gains from water h	eating,	kWh/mo	onth 0.2	5 ′[0.85 × (45)m	+ (6	1)m]	+ 0.8 x	[(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 89.98 79.87 85.18 78.17 77.92 71.51 70.47 74.85 73.95 80.97 83.34 88.43												(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	П	Jun Jul	Aı	ug	Sep	Oct	Nov	Dec]	
 	119.13	119.13	119.13	_	9.13 119.13	119	- +	119.13	119.13	119.13	119.13		(66)
Lighting gains (calculate	ed in Ap	pendix l	L. eguat	ட ion	L L9 or L9a). a	lso s	ee Ta	able 5			<u>I</u>	ı	
	14.69	11.12	8.31	_	.02 7.58	9.8	$\overline{}$	13.23	16.8	19.61	20.91	1	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 210.88 213.07 207.55 195.81 180.99 167.07 157.76 155.57 161.09 172.83 187.65 201.57 (68)													(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 (69)													(69)
` '			01.01		1.01	0 1	<u> </u>	0 1.01	0 1.0 1	001	0 1.0 1	I	()
Pumps and fans gains (70)m= 3 3	3	a) 3	3		3 3	3		3	3	3	3	1	(70)
				L				<u> </u>				l	(10)
Losses e.g. evaporation (71)m= -95.3 -95.3	-95.3	-95.3	-95.3	_	95.3 -95.3	-95	<u>, </u>	-95.3	-95.3	-95.3	-95.3	1	(71)
` '	!	-90.0	-95.5		5.5 -95.5	-90		-90.3	-90.5	-95.5	-90.5	J	(7-1)
Water heating gains (Ta		100.57	404.70		0.00	400	<u> </u>	400 7	100.00	145 75	440.00	1	(70)
` '	114.49	108.57	104.73	98	94.72	100		102.7	108.83		118.86	J	(72)
Total internal gains =	[(66)m + (67)m		<u> </u>	·	, ,	<u>, , , , , , , , , , , , , , , , , , , </u>		1	(70)
` '	398.48	377.25	355.78	33	5.14 321.8	327	.78	338.76	360.2	384.75	403.08		(73)
6. Solar gains: Solar gains are calculated us	oina color	flux from	Toblo 60	and	associated agus	tiona t	to con	vort to the	o opplied	blo orientat	ion		
Orientation: Access Fa	•	Area		anu	Flux	110115			з аррііса	FF	IOH.	Gains	
Table 6d	Cloi	m ²			Table 6a			g_ ble 6b	٦	able 6c		(W)	
Northeast _{0.9x} 0.54	х	3.1	7	x	11.28	x		0.63	х	0.7	=	30.66	(75)
Northeast _{0.9x} 0.54	х	3.1	7	x	22.97	х		0.63	×	0.7	_	62.42	(75)
Northeast 0.9x 0.54	x	3.1	7	x [41.38	x		0.63		0.7		112.45	(75)
Northeast 0.9x 0.54	x	3.1	7	x	67.96	x		0.63	x	0.7	=	184.68	(75)
Northeast 0.9x 0.54	3.1	7	x	91.35	x		0.63] x [0.7	= =	248.25	(75)	
Northeast 0.9x 0.54				97.38	x		0.63	x	0.7		264.66	(75)	
Northeast 0.9x 0.54	7	x	91.1	x		0.63	x	0.7		247.58	(75)		
Northeast 0.9x 0.54	x	3.1		x [72.63	х		0.63	x	0.7		197.37] (75)
0.01		0.1		L	72.00			0.00	┙┕	· · · · · · · · · · · · · · · · · · ·		107.07	」 `

Northea	st 0.9x	0.54	x	3.1	7	x	5	0.42	x		0.63	X	0.7	=	137.03	(75)
Northea	st _{0.9x}	0.54	x	3.1	7	x	2	8.07	x		0.63	_ x _	0.7		76.28	(75)
Northea	st _{0.9x}	0.54	x	3.1	7	X		14.2	х		0.63	x	0.7	=	38.58	(75)
Northea	st _{0.9x}	0.54	x	3.1	7	X	,	9.21	х		0.63	_ x _	0.7	=	25.04	(75)
	_								•							
Solar g	ains in	watts. ca	alculated	for eac	h month				(83)m	n = Sı	um(74)m .	(82)m				
(83)m=	30.66	62.42	112.45	184.68	248.25		64.66	247.58	197	.37	137.03	76.28	38.58	25.04]	(83)
Total ga	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts							ı	
(84)m=	444.57	474.14	510.93	561.93	604.02	5	599.8	569.38	525	.16	475.79	436.48	423.33	428.12		(84)
7. Mea	an inter	nal temp	erature	(heating	season)										
			eating p				area	from Tab	ole 9	. Th	1 (°C)				21	(85)
•		Ū	ains for I			·			010 0	,	. (0)				21	
Г	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Γ_Λ	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	0.99	0.96	0.86	-	0.66	0.49	0.5	Ť	0.83	0.98	1	1		(86)
` ' L			ļļ			_		<u> </u>		!		0.90			l	(00)
Mean			ature in I		ea T1 (fo	_		ps 3 to 7	in T	able	e 9c)		1	1	1	
(87)m=	20.14	20.24	20.42	20.68	20.9		20.98	21	2	1	20.94	20.68	20.37	20.13		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	velling	from Ta	able 9	9, Tł	n2 (°C)					
(88)m=	20.2	20.2	20.2	20.21	20.21	2	20.22	20.22	20.	22	20.21	20.21	20.21	20.2		(88)
Utilisa	tion fac	tor for a	ains for r	est of d	welling	h2	m (se	e Table	9a)	•			•	•	•	
(89)m=	1	1	0.99	0.95	0.82		0.59	0.41	0.4	46	0.77	0.97	0.99	1		(89)
	·			U 4	a.£. al a.113		TO /	. !!			7 : Talal	- 0-\			l	
(90)m=	19.04	19.18	ature in 1	19.83	20.11	Ť	12 (To 20.21	20.22	20.		20.16	e 9c) 19.83	19.38	19.02]	(90)
(90)111=	19.04	19.16	19.45	19.03	20.11		20.21	20.22	20.	22			g area ÷ (4		0.57	¬ `´
											'	LA = LIVIII	y area - (-	+) =	0.57	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	A) × T2		•	•		
(92)m=	19.67	19.78	20	20.32	20.56	2	20.65	20.66	20.	66	20.61	20.31	19.95	19.65		(92)
Apply	adjustn	nent to tl	he mean	internal	temper	atu	ire fro	m Table	4e,	whe	re appro	priate			,	
(93)m=	19.67	19.78	20	20.32	20.56	2	20.65	20.66	20.	66	20.61	20.31	19.95	19.65		(93)
8. Spa	ice hea	ting requ	uirement													
			ernal ten	•		nec	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=(76)m an	d re-cald	culate	
the uti		l .	or gains u			_								T	1	
L	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Г			ains, hm					T		. 1			T	I .	1	(0.4)
(94)m=	1	0.99	0.99	0.95	0.84		0.63	0.46	0.5	51	0.8	0.97	0.99	1		(94)
			W = (94)	<u> </u>		_		1	_				1	1	1	(0.7)
` ′	443.21	471.67	504.28	535.43	508.25	_	78.92	259.11	270	.36	382.62	422.79	420.63	427.08		(95)
	-	_	rnal tem					1					1	1	1	
(96)m=	4.3	4.9	6.5	8.9	11.7	<u> </u>	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
			an intern			_					– (96)m	ī —	ı	ı	1	
(97)m=	1012.52	977.87	885.06	739.65	572.61	3	87.22	259.98	272	2.2	418.01	627.98	834.24	1008.09		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh	n/mon	th = 0.02	24 x	(97)	m – (95)m] x (4	1)m		,	
(98)m=	423.56	340.17	283.29	147.04	47.88	L	0	0	С		0	152.66	297.79	432.27		_
										Total	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2124.67	(98)
Space	heatin	g require	ement in	kWh/m²	?/year										27.96	(99)
•		- •			-											

9a. Energy requiremer	nts – Indiv	vidual h	eating sv	vstems i	ncluding	micro-C	CHP)					
Space heating:					<u> </u>		,					
Fraction of space hea		,		mentary	•						0	(201)
Fraction of space hea		•	. ,			(202) = 1 -					1	(202)
Fraction of total heati	•	-				(204) = (204)	02) × [1 –	(203)] =			1	(204)
Efficiency of main spa	ace heati	ng syste	em 1								93.5	(206)
Efficiency of seconda	ry/supple	ementar	y heating	g systen	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating require	<u> </u>		i				0	450.00	007.70	400.07	1	
423.56 340.17	283.29	147.04	47.88	0	0	0	0	152.66	297.79	432.27		,
(211) m = {[(98)m x (20) 453.01 363.82		00 ÷ (20 157.26	6) 51.21	0	0	0	0	163.27	318.5	462.22		(211)
453.01 363.82	302.99	157.20	31.21	U	U		I (kWh/yea			462.32	2272.37	(211)
Space heating fuel (s	ocondon	η Κ/ // b/	month			7010	i (kwii) you	ar) =00m(2	- ' '/15,1012	2	2212.31	(211)
= {[(98)m x (201)] } x 1	-	•	monun									
(215)m = 0 0	0	0	0	0	0	0	0	0	0	0		
	!!					Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u> </u>	0	(215)
Water heating												
Output from water hea					T					·	1	
199.02 175.52	184.59	165.81	162.74	145.77	140.33	153.52	153.1	171.92	181.36	194.35	70.0	7(246)
Efficiency of water hea 86.78 86.55	85.95	84.5	82	79.8	79.8	79.8	79.8	84.5	86.13	86.89	79.8	(216)
Fuel for water heating,			02	79.0	79.0	79.0	19.0	04.3	00.13	00.09		(217)
(219)m <u> = (64)m x 100</u>											_	
(219)m= 229.34 202.8	214.75	196.24	198.45	182.67	175.86	192.38	191.86	203.46	210.57	223.68		_
						Tota	I = Sum(2				2422.05	(219)
Annual totals Space heating fuel use	nd main	evetom	1					k\	Wh/yeaı		kWh/yea 2272.37	<u>r</u>
		system										╡
Water heating fuel use											2422.05	
Electricity for pumps, fa	ans and	electric	keep-ho	t								
central heating pump	:									30		(2300
boiler with a fan-assis	ted flue									45		(230
Total electricity for the	above, k	Wh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											359.22	
12a. CO2 emissions -	– Individu	ıal heat	na svste	ms incl	ıdina mi	cro-CHP						``
12a. 332 amissions	marviac	airnoat	ng dyote	71110 111010	adirig iiii	010 0111						
					ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main s	ystem 1)			(21	1) x			0.2	16	=	490.83	(261)
Space heating (second	dary)			(21	5) x			0.5	19	=	0	(263)
Water heating				(219	9) x			0.2		=	523.16	(264)
Space and water heati	na					+ (263) + (264) =		· •			=
opace and water neal	9			(20	, (202)	(===) . (, ·				1014	(265)

Electricity for pumps, fans and electric keep-hot (231) × (232) × (232) × (232) × (232) × (233) × (267) = (234) (268) (268) (272) (271) = (239.36) (272)

TER =

(273)

23.65

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 *Printed on 24 November 2020 at 17:44:46*

Proiect Information:

Assessed By: Vitaliy Troyan (STRO018096) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 102.3m²

Site Reference: Tottenham Mews Plot Reference: 2 04 - 3B5P

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 21.14 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 8.59 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 39.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.1 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.20 (max. 0.30)0.20 (max. 0.70)

Floor (no floor) Roof (no roof)

Openings 1.10 (max. 2.00) 1.10 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs **OK**

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
3 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	79%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
ased on:		
Overshading:	Average or unknown	
Windows facing: North East	6.58m²	
Windows facing: South West	2.1m²	
Windows facing: North East	3.17m²	
Windows facing: South West	6.58m²	
Ventilation rate:	6.00	
Blinds/curtains:	Dark-coloured curtain or roller	r blind
	Closed 100% of daylight hour	S
10 Koy footuros		
10 Key features Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
	1.1 VV/111-K	
Community heating, heat from electric heat pump		

Photovoltaic array

Assessor Name: Vitaliy Troyan Stroma Number: STRO018096 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.12 Property Address: 2_04 - 3B5P
Property Address: 2 04 - 3B5P
Address:
1. Overall dwelling dimensions:
Area(m²) Av. Height(m) Volume(m³)
Ground floor 102.3 (1a) x 2.65 (2a) = 271.1 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 102.3 (4)
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 271.1$ (5)
2. Ventilation rate:
main secondary other total m³ per hour heating heating
Number of chimneys $0 + 0 + 0 = 0 \times 40 = 0$ (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$ (6b)
Number of intermittent fans $0 x 10 = 0 (7a)$
Number of passive vents $0 x 10 = 0 (7b)$
Number of flueless gas fires $0 x 40 = 0 (7c)$
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)
Additional infiltration $[(9)-1]\times 0.1 = 0 $ (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)
If no draught lobby, enter 0.05, else enter 0
Percentage of windows and doors draught stripped 0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)
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 4 (19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.7$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.1$ (21)
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
(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	speed) =	(21a) x	(22a)m					
0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12]	
Calculate effect		-	rate for t	he appli	cable ca	se							(23a
If exhaust air he			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	wise (23b) = (23a)			0.5	(23a)
If balanced with									, (200)			0.5 67.15	(230
a) If balance		•	•	J		`		'	2h\m + (23h) 🗴 [1 – (23c)		(230
(24a)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29]	(24a
b) If balance	d mecha	anical ve	ntilation	without	heat rec	coverv (N	ı ЛV) (24b)m = (22	2b)m + (1 23b)	<u> </u>	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b
c) If whole h					•				5 × (23b))	!	1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(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	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.3	0.3	0.29	0.28	0.28	0.26	0.26	0.26	0.27	0.28	0.28	0.29		(25)
3. Heat losse	s and he	eat loss r	paramet	er.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	λΧk
	area	(m²)	m		A ,r		W/m2		(W/	K)	kJ/m²-		J/K
Windows Type	: 1				6.58	x1,	/[1/(1.1)+	0.04] =	6.93				(27)
Windows Type	2				1.05	x1,	/[1/(1.1)+	0.04] =	1.11				(27)
Windows Type	: 3				3.17	x1,	/[1/(1.1)+	0.04] =	3.34				(27)
Windows Type	4				3.29	x1,	/[1/(1.1)+	0.04] =	3.47				(27)
Walls Type1	58.8	8	18.4	3	40.37	y X	0.2	= [8.07				(29)
Walls Type2	20.	1	0		20.1	Х	0.19	= [3.72				(29)
Total area of e	lements	, m²			78.9								(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	h 3.2	
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				31.21	(33)
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	•	•		,					tive Value			100	(35)
For design assess can be used instead				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
Thermal bridge				usina An	pendix k	<						11.84	(36)
if details of therma	,	,			•							11.01	(33)
Total fabric he	at loss							(33) +	(36) =			43.05	(37)
Ventilation hea	t loss ca	alculated	monthl	/				(38)m	= 0.33 × ((25)m x (5))	-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 26.67	26.44	26.2	25.03	24.79	23.62	23.62	23.38	24.09	24.79	25.26	25.73]	(38)
Heat transfer o	oefficier	nt, W/K						(39)m	= (37) + (38)m		_	
(39)m= 69.72	69.49	69.25	68.08	67.84	66.67	66.67	66.43	67.14	67.84	68.31	68.78		
									Average =	Sum(39) ₁	12 /12=	68.02	(39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.68	0.68	0.68	0.67	0.66	0.65	0.65	0.65	0.66	0.66	0.67	0.67		
				!		!			Average =	Sum(40) ₁	12 /12=	0.66	(40)
Number of day	<u> </u>			·	i .				<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 requi	rement:								kWh/ye	ar:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		76		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed			se target c		.75		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 109.72	105.73	101.74	97.75	93.76	89.77	89.77	93.76	97.75	101.74	105.73	109.72		
										m(44) ₁₁₂ =	L	1196.95	(44)
Energy content of	f hot water	used - cal	culated me	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= 162.71	142.31	146.85	128.03	122.85	106.01	98.23	112.72	114.07	132.93	145.11	157.58		_
If instantaneous v	vator hoati	na at noint	of use (no	n hot water	r storage)	antar () in	hoves (16		Total = Su	m(45) ₁₁₂ =	= [1569.39	(45)
			,		· ·		· · ·	, , , I	1004	04.77	00.04		(46)
(46)m= 24.41 Water storage	21.35 loss:	22.03	19.2	18.43	15.9	14.73	16.91	17.11	19.94	21.77	23.64		(46)
Storage volum) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If community h	neating a	and no ta	nk 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				!	(1.) (1.)	- /-1 \					1		(40)
a) If manufact				or is kno	wn (Kvvi	n/day):					24		(48)
Temperature f							(40) (40)				.6		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)) =		1.	34		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor			Ol-								0		(52)
Temperature f											0		(53)
Energy lost fro Enter (50) or		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Water storage	` , ` `	,	or each	month			((56)m - ((55) × (41)	m	1.	34		(55)
					40.00		. , ,	·		1,000			(FC)
(56)m= 41.66 If cylinder contain	37.63	41.66	40.32	41.66 m = (56)m	40.32 × [(50) = (41.66	41.66	40.32 7)m = (56)	41.66	40.32 H11) is fro	41.66	v H	(56)
												A 1 1	(57)
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	,	•									0		(58)
Primary circuit				,	•	• •	, ,		r thorns -	otot)			
(modified by	21.01				ı —			-	1	'	22.26		(59)
(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		(38)

Combi loss calcula	ed for eac	h month	(61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(61)
Total heat required	L for water h	neating c	alculated	l for eac	h month	(62)r	<u>—</u> m =	0.85 x (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 227.64 200		190.86	187.77	168.84	163.16	177.	_	176.9	197.86	207.94	222.5]	(62)
Solar DHW input calcula	ted using Ap	pendix G o	r Appendix	H (negati	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	J	
(add additional line	if FGHRS	and/or \	NWHRS	applies	, see Ap	pend	lix G	3)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water I	eater	•			•		•		•	•	•	•	
(64)m= 227.64 200	95 211.78	190.86	187.77	168.84	163.16	177.	.65	176.9	197.86	207.94	222.5]	
	•	•			•		Outp	ut from wa	ater heate	er (annual)	112	2333.85	(64)
Heat gains from wa	ter heating	ı, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	i] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 106.04 94.2	3 100.77	92.83	92.79	85.51	84.6	89.4	42	88.19	96.14	98.51	104.34]	(65)
include (57)m in	alculation	of (65)m	only if c	ylinder i	s in the	dwelli	ing (or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see Table	5 and 5a):										
Metabolic gains (Ta	ble 5), Wa	tts											
Jan Fe		Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 137.99 137.	99 137.99	137.99	137.99	137.99	137.99	137.	.99	137.99	137.99	137.99	137.99		(66)
Lighting gains (calc	ulated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5			-	-	
(67)m= 24.01 21.3	2 17.34	13.13	9.81	8.28	8.95	11.6	64	15.62	19.83	23.14	24.67]	(67)
Appliances gains (d	alculated i	n Appen	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ble 5		•	•	
(68)m= 259.99 262	69 255.89	241.42	223.15	205.98	194.51	191.	.81	198.61	213.08	231.35	248.52]	(68)
Cooking gains (calc	ulated in A	Appendix	L, equat	ion L15	or L15a), also	o se	e Table	5	•	•	•	
(69)m= 36.8 36.	36.8	36.8	36.8	36.8	36.8	36.	8	36.8	36.8	36.8	36.8]	(69)
Pumps and fans ga	ins (Table	5a)			•							•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evapor	ation (nega	ative valu	es) (Tab	le 5)	-				=		-	-	
(71)m= -110.39 -110	39 -110.39	-110.39	-110.39	-110.39	-110.39	-110	.39	-110.39	-110.39	-110.39	-110.39]	(71)
Water heating gain	(Table 5)		-		-				-	-	-	-	
(72)m= 142.53 140.	23 135.44	128.94	124.71	118.77	113.71	120.	.19	122.49	129.22	136.83	140.24]	(72)
Total internal gain	s =			(66)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m		
(73)m= 490.93 488.	64 473.07	447.88	422.07	397.43	381.57	388.	.03	401.11	426.53	455.72	477.83		(73)
6. Solar gains:													
Solar gains are calcula	•	ar flux from	Table 6a		•	tions t	to co	nvert to th	e applica		tion.		
Orientation: Acces		Area m²		Flu	ıx ble 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
						, ,	1		_ '				1
	.54	6.	58	X	11.28	X		0.44	_ ×	0.8	=	12.7	(75)
Nieutheest	.54			Χ	11.28	X		0.44	_ ×	8.0	=	6.12	(75)
N	.54			-	22.97	X		0.44	_ ×	0.8	=	25.85	(75)
	.54	3.	17	-	22.97	X		0.44	×	8.0	=	12.45	(75)
Northeast _{0.9x}	.54	6.5	58	X 2	41.38	X		0.44	X	0.8	=	46.58	(75)

Northwest		7		1		1		ı		1		–
Northeast _{0.9x}	0.54	X	3.17	X	41.38	X	0.44	X	0.8	=	22.44	(75)
Northeast _{0.9x}	0.54	X	6.58	X	67.96	X	0.44	X	0.8	=	76.49	(75)
Northeast _{0.9x}	0.54	X	3.17	X	67.96	X	0.44	X	0.8	=	36.85	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.35	X	0.44	X	0.8	=	102.82	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.35	X	0.44	X	0.8	=	49.54	(75)
Northeast _{0.9x}	0.54	X	6.58	X	97.38	X	0.44	X	0.8	=	109.62	(75)
Northeast _{0.9x}	0.54	X	3.17	X	97.38	X	0.44	X	0.8	=	52.81	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.1	X	0.44	X	0.8	=	102.55	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.1	X	0.44	X	0.8	=	49.4	(75)
Northeast 0.9x	0.54	X	6.58	X	72.63	X	0.44	x	0.8	=	81.75	(75)
Northeast _{0.9x}	0.54	X	3.17	X	72.63	X	0.44	X	0.8	=	39.39	(75)
Northeast _{0.9x}	0.54	X	6.58	X	50.42	X	0.44	X	0.8	=	56.76	(75)
Northeast _{0.9x}	0.54	X	3.17	x	50.42	x	0.44	x	0.8	=	27.34	(75)
Northeast _{0.9x}	0.54	X	6.58	X	28.07	x	0.44	x	0.8	=	31.59	(75)
Northeast _{0.9x}	0.54	X	3.17	x	28.07	x	0.44	x	0.8	=	15.22	(75)
Northeast _{0.9x}	0.54	X	6.58	x	14.2	х	0.44	x	0.8	=	15.98	(75)
Northeast _{0.9x}	0.54	X	3.17	X	14.2	x	0.44	x	0.8	=	7.7	(75)
Northeast _{0.9x}	0.54	X	6.58	x	9.21	x	0.44	x	0.8	=	10.37	(75)
Northeast _{0.9x}	0.54	x	3.17	x	9.21	x	0.44	x	0.8	=	5	(75)
Southwest _{0.9x}	0.54	x	1.05	x	36.79		0.44	x	0.8	=	13.22	(79)
Southwest _{0.9x}	0.54	X	3.29	x	36.79		0.44	x	0.8	=	41.42	(79)
Southwest _{0.9x}	0.54	X	1.05	x	62.67]	0.44	x	0.8	=	22.52	(79)
Southwest _{0.9x}	0.54	x	3.29	x	62.67	Ì	0.44	x	0.8	=	70.55	(79)
Southwest _{0.9x}	0.54	X	1.05	x	85.75		0.44	x	0.8	=	30.81	(79)
Southwest _{0.9x}	0.54	x	3.29	x	85.75		0.44	x	0.8	=	96.53	(79)
Southwest _{0.9x}	0.54	x	1.05	x	106.25		0.44	x	0.8	=	38.17	(79)
Southwest _{0.9x}	0.54	X	3.29	x	106.25		0.44	x	0.8] =	119.6	(79)
Southwest _{0.9x}	0.54	x	1.05	x	119.01]	0.44	x	0.8	=	42.75	(79)
Southwest _{0.9x}	0.54	x	3.29	x	119.01	Ī	0.44	x	0.8] =	133.96	(79)
Southwest _{0.9x}	0.54	X	1.05	x	118.15	ĺ	0.44	x	0.8] =	42.45	(79)
Southwest _{0.9x}	0.54	x	3.29	x	118.15]	0.44	x	0.8] =	133	(79)
Southwest _{0.9x}	0.54	x	1.05	x	113.91	ĺ	0.44	x	0.8	=	40.92	(79)
Southwest _{0.9x}	0.54	x	3.29	x	113.91	ĺ	0.44	x	0.8	=	128.22	(79)
Southwest _{0.9x}	0.54	x	1.05	x	104.39	ĺ	0.44	x	0.8	j =	37.5	(79)
Southwest _{0.9x}	0.54	x	3.29	x	104.39	ĺ	0.44	x	0.8	j =	117.51	(79)
Southwest _{0.9x}	0.54	x	1.05	×	92.85	i	0.44	x	0.8	j =	33.36	(79)
Southwest _{0.9x}	0.54	×	3.29	×	92.85	j	0.44	x	0.8	j =	104.52	(79)
Southwest _{0.9x}	0.54	x	1.05	×	69.27	i	0.44	x	0.8	j =	24.88	(79)
Southwest _{0.9x}	0.54	X	3.29	X	69.27	ĺ	0.44	x	0.8	=	77.97	(79)
Southwest _{0.9x}	0.54	X	1.05	X	44.07	j	0.44	x	0.8	=	15.83	(79)
Southwest _{0.9x}	0.54	X	3.29	X	44.07	ĺ	0.44	x	0.8	=	49.61	(79)
<u> </u>		_		1		1		l				

Southwesto.9x
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 73.45
(83)m=
(83)m=
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m=
(84)m= 564.38 620.01 669.42 719 751.15 735.3 702.66 664.18 623.09 576.2 544.84 539.95 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(86)m= 0.96 0.95 0.91 0.84 0.72 0.55 0.41 0.45 0.66 0.86 0.94 0.97 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(87)m= 19.71 19.89 20.18 20.54 20.81 20.95 20.99 20.98 20.89 20.56 20.09 19.68 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)
(89)m= 0.96 0.94 0.9 0.82 0.69 0.5 0.35 0.39 0.62 0.84 0.94 0.96 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)
(90)m= 18.59 18.86 19.28 19.79 20.15 20.33 20.37 20.37 20.27 19.83 19.15 18.55 (90)
$fLA = Living area \div (4) = 0.47 $ (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$
(92)m= 19.12 19.35 19.7 20.14 20.46 20.63 20.66 20.66 20.56 20.18 19.6 19.09 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate
(93)m= 19.12 19.35 19.7 20.14 20.46 20.63 20.66 20.66 20.56 20.18 19.6 19.09 (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= 0.95 0.93 0.89 0.81 0.69 0.52 0.38 0.42 0.63 0.84 0.92 0.96 (94)
Useful gains, hmGm , W = (94)m x (84)m
(95)m= 535.68 576.16 596.93 585.95 518.63 382.85 266.66 276.88 393.95 481.69 503.8 515.7 (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= 1033.3 1003.97 914.44 765.51 594.32 401.73 270.98 283.06 434.03 649.66 853.56 1023.87 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(98)m= 370.23 287.48 236.23 129.28 56.31 0 0 0 124.97 251.82 378.08
Total per year $(kWh/year) = Sum(98)_{15,912} = 1834.42$ (98)
$\frac{1004.42}{1004.42} = \frac{1004.42}{1004.42}$
Space heating requirement in kWh/m²/year 17.93 (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 1	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 fo includes boilers, heat pumps, geothermal and waste heat from power stations. See Apple	•		」` ′ -
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 he	eating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating Annual space heating requirement		kWh/year 1834.42	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1926.14	(307a)
Efficiency of secondary/supplementary heating system in % (from Table	le 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		2333.85	- 7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2450.54	(310a)
Electricity used for heat distribution 0.0	11 × [(307a)(307e) + (310a)(310e)] =	43.77	(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	e	252.19	(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) =	252.19	(331)
Energy for lighting (calculated in Appendix L)		423.94	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-776.42	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme			
	nergy Emission factor Vh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fue	els repeat (363) to (366) for the second fue	250	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x	(100 ÷ (367b) x 0.52 =	908.6	(367)
Electrical energy for heat distribution [(313) x	0.52	22.71	(372)
Total CO2 accordated with community systems			٦,,,,,,
Total CO2 associated with community systems (363)(366) + (368)(372)	931.31	(373)
CO2 associated with space heating (secondary) (309) x	366) + (368)(372) = 0 =	931.31	(373)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 931.31 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 130.88 CO2 associated with electricity for lighting (332))) x (379) 0.52 220.03 Energy saving/generation technologies (333) to (334) as applicable x = 0.01 =Item 1 (380)0.52 -402.96 sum of (376)...(382) =Total CO2, kg/year 879.26 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)8.59 El rating (section 14) (385)92

			User D	otoile:						
	\". F = T		USELL					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 201	12		Strom: Softwa					018096 on: 1.0.5.12	
Software Name.	Stroma i SAI 20		operty .	Address				VCISIO	71. 1.0.5.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	1(0-)	Volume(m ³	<u>-</u>
	\				(1a) x	2	.65	(2a) =	271.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n))1	02.3	(4)					_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	271.1	(5)
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır
N. selven of all leaves a	heating	neating	· —		, –			40		_
Number of chimneys	0 +	0]	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] + L	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	4	X '	10 =	40	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	Sa)+(6b)+(7a	a)+(7b)+(7c) =	Г	40		÷ (5) =	0.15	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.15	(0)
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
deducting areas of openi		sponding to	ırıe great	er wan 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, en	ter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	, ,	_			0	(15)
Infiltration rate		_		(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,	· ·		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil Air permeability value applie						is haina u	sad		0.4	(18)
Number of sides sheltere		s been done	or a deg	gree air per	теаышу	is being u	seu		4	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.28	(21)
Infiltration rate modified f	or monthly wind speed	d						!		
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2\m ÷ 4									
<u> </u>	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
						<u> </u>	Ц	L	J	

0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33		
alculate effe		-	rate for t	he appli	cable ca	se						<u>-</u>	
If mechanical If exhaust air h			andiv N. (2	2h) _ (22c	a) × Emy (c	auation (N	JEN otho	avica (22h) - (222)			0	(2
If balanced with) = (23a)			0	(2
		•	-	_					2h\ //	00h) [/	1 (00 a)	0	(2
a) If balance	o mech	o o	0	o with ries	0		1K) (248	0	0	23D) x [0) - 100]]	(2
b) If balance			-									_	(-
4b)m= 0	o mecn	o 0	0	without 0	0	overy (N	0	0	0	23D) 0	0	7	(2
c) If whole h							<u> </u>		Ů			_	(-
if (22b)n				•	•				5 x (23b)			
4c)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	n from l	oft	Į		<u>!</u>	_	
if (22b)n				•	•				0.5]			_	
4d)m= 0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(
. Heat losse	s and he	eat loss r	naramete	ōt.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-valu	e	ΑΧk
	area	(m^2)	m		A ,r		W/m2		(W/I	<)	kJ/m²•		kJ/K
indows Type	: 1				6.58	x1,	/[1/(1.4)+	0.04] =	8.72				(
indows Type	2				1.05	x1,	/[1/(1.4)+	0.04] =	1.39				(
indows Type	3				3.17	x1,	/[1/(1.4)+	0.04] =	4.2				(:
indows Type	4				3.29	x1,	/[1/(1.4)+	0.04] =	4.36				(
alls Type1	58.	8	18.43	3	40.37	, x	0.18	□ = Ī	7.27	<u> </u>			(:
alls Type2	20.	1	0		20.1	x	0.18	<u> </u>	3.62	=		7 F	
otal area of e					78.9								(
or windows and	roof wind	ows, use e	ffective wi	ndow U-va		 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapi	h 3.2	`
include the area	as on both	sides of in	ternal wal	ls and par	titions								
bric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				35.32	(
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(
r design assess n be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
nermal bridge				ısina Ar	pendix l	<						3.95	(
letails of therma	•	,			-	•						3.93	(
tal fabric he			,	,	,			(33) +	(36) =			39.26	(
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]	
	50.14	49.93	48.92	48.73	47.86	47.86	47.69	48.19	48.73	49.11	49.51]	(
3)m= 50.36					-		_				_	_	
3)m= 50.36 eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.88	0.87	0.87	0.86	0.86	0.85	0.85	0.85	0.85	0.86	0.86	0.87		
Number of de	vo in mo	nth /Tabl	0.10)					,	Average =	Sum(40) ₁ .	12 /12=	0.86	(40)
Number of day Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		<u> </u>								<u> </u>			
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		76		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.75		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				<u></u>				Сор		1			
(44)m= 109.72	105.73	101.74	97.75	93.76	89.77	89.77	93.76	97.75	101.74	105.73	109.72		
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	1196.95	(44)
(45)m= 162.71	142.31	146.85	128.03	122.85	106.01	98.23	112.72	114.07	132.93	145.11	157.58		
		<u> </u>						-	L Total = Su	M(45) ₁₁₂ =	=	1569.39	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)					
(46)m= 24.41	21.35	22.03	19.2	18.43	15.9	14.73	16.91	17.11	19.94	21.77	23.64		(46)
Water storage Storage volum) includin	n anv so	olar or W	/WHRS	storane	within sa	ame ves	امء		150		(47)
If community h	` '		•			•		ATTIC VOO	001		130		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	65		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	89		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			<u> </u>	,	.,,					<u> </u>		(0.)
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (5	55)								0.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	, ,		r thoras -	otot)			
(modified by					ı —	ı —			ı —	<u> </u>	22.22		(59)
(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		(38)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
	oulated	for each	month ($\frac{(61)m}{0}$	(60) ÷ 3	$\frac{65 \times (41)}{0}$		Ι ο	T 0	0	Ι ,	1	(61)
` '				<u> </u>			(00)	0 05	<u> </u>		(57)	(50) (64)	(01)
Total heat requi	188.31	197.78	177.31	173.77	155.29	149.16	(6∠)m 163.65		(45)m + 183.86	(46)m + 194.39	(57)m + 208.5	(59)m + (61)m]	(62)
Solar DHW input ca				<u> </u>			l					l	(02)
(add additional									ir contribut	ion to wate	er nealing)		
(63)m= 0	0	0	0	0	0	0	0	To	0	0	0]	(63)
Output from wa	ter hea	ter		<u> </u>		<u> </u>			<u> </u>	<u> </u>		I	. ,
· -	188.31	197.78	177.31	173.77	155.29	149.16	163.65	163.35	183.86	194.39	208.5]	
` ,							<u></u> Οι	I itput from w	ater heate	I r (annual)₁	12	2169	(64)
Heat gains from	n water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)	ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 94.84	84.12	89.57	82	81.59	74.67	73.4	78.22	77.35	84.94	87.68	93.14	اُ	(65)
include (57)m	n in calc	culation (of (65)m	only if c	vlinder i	s in the o	dwellin	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal gai			` ′		,								
Metabolic gains	` `			, ·									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 137.99	137.99	137.99	137.99	137.99	137.99	137.99	137.99	+	137.99	137.99	137.99		(66)
Lighting gains (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5	•	•	•	1	
(67)m= 24.66	21.91	17.81	13.49	10.08	8.51	9.2	11.95	16.05	20.37	23.78	25.35		(67)
Appliances gair	ns (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5			1	
· · · — — —	262.69	255.89	241.42	223.15	205.98	194.51	191.81		213.08	231.35	248.52		(68)
Cooking gains (calcula)	ted in A	pendix	L, equat	ion L15	or L15a), also	see Table	5			1	
(69)m= 36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8		(69)
Pumps and fan:	s gains	(Table 5	īa)									1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. eva	aporatio	n (nega	ive valu	es) (Tab	le 5)	•	•	•	•	•	•	•	
(71)m= -110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39	-110.39]	(71)
Water heating g	gains (T	able 5)		•		•	•	•	•	•	•	•	
(72)m= 127.48	125.17	120.39	113.88	109.66	103.71	98.66	105.14	107.44	114.17	121.77	125.18		(72)
Total internal	gains =				(66)m + (67)m	n + (68)m	ı + (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 479.53	477.17	461.49	436.19	410.29	385.6	369.76	376.29	389.48	415.02	444.3	466.45		(73)
6. Solar gains:						•	•	•	•	•	•		
Solar gains are ca	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to the	ne applicat	ole orientat	tion.		
Orientation: A		actor	Area		Flu			g_ T-5-1- Cb	_	FF		Gains	
_	able 6d		m²			ble 6a	. –	Table 6b	_ '	able 6c		(W)	_
Northeast _{0.9x}	0.54	X	6.5	58	х	11.28	x	0.63	x	0.7	=	15.91	(75)
Northeast _{0.9x}	0.54	Х	3.1	7	х	11.28	x	0.63	x	0.7	=	7.67	(75)
Northeast _{0.9x}	0.54	X	6.5	58	x	22.97	X	0.63	x	0.7	=	32.39	(75)
Northeast _{0.9x}	0.54	X	3.1	7	x	22.97	X	0.63	x	0.7	=	15.6	(75)
Northeast _{0.9x}	0.54	X	6.5	58	X	11.38	X	0.63	Х	0.7	=	58.36	(75)

		,				,				,		_
Northeast _{0.9x}	0.54	X	3.17	X	41.38	X	0.63	X	0.7	=	28.11	(75)
Northeast _{0.9x}	0.54	X	6.58	X	67.96	X	0.63	X	0.7	=	95.84	(75)
Northeast _{0.9x}	0.54	X	3.17	X	67.96	X	0.63	X	0.7	=	46.17	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.35	X	0.63	X	0.7	=	128.82	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.35	X	0.63	X	0.7	=	62.06	(75)
Northeast _{0.9x}	0.54	X	6.58	X	97.38	X	0.63	X	0.7	=	137.34	(75)
Northeast 0.9x	0.54	X	3.17	x	97.38	X	0.63	X	0.7	=	66.16	(75)
Northeast _{0.9x}	0.54	X	6.58	X	91.1	X	0.63	X	0.7	=	128.48	(75)
Northeast _{0.9x}	0.54	X	3.17	X	91.1	X	0.63	X	0.7	=	61.9	(75)
Northeast 0.9x	0.54	X	6.58	x	72.63	X	0.63	X	0.7] =	102.42	(75)
Northeast _{0.9x}	0.54	X	3.17	x	72.63	x	0.63	x	0.7	=	49.34	(75)
Northeast _{0.9x}	0.54	X	6.58	x	50.42	X	0.63	x	0.7	=	71.11	(75)
Northeast _{0.9x}	0.54	X	3.17	x	50.42	X	0.63	x	0.7	=	34.26	(75)
Northeast _{0.9x}	0.54	X	6.58	x	28.07	X	0.63	x	0.7	=	39.58	(75)
Northeast _{0.9x}	0.54	X	3.17	x	28.07	X	0.63	X	0.7	=	19.07	(75)
Northeast _{0.9x}	0.54	X	6.58	x	14.2	X	0.63	x	0.7	=	20.02	(75)
Northeast _{0.9x}	0.54	X	3.17	x	14.2	X	0.63	X	0.7	=	9.65	(75)
Northeast _{0.9x}	0.54	X	6.58	x	9.21	X	0.63	x	0.7	=	12.99	(75)
Northeast _{0.9x}	0.54	X	3.17	x	9.21	X	0.63	x	0.7	=	6.26	(75)
Southwest _{0.9x}	0.54	X	1.05	х	36.79		0.63	X	0.7	=	16.56	(79)
Southwest _{0.9x}	0.54	X	3.29	х	36.79		0.63	x	0.7	=	51.89	(79)
Southwest _{0.9x}	0.54	X	1.05	x	62.67	ĺ	0.63	x	0.7] =	28.21	(79)
Southwest _{0.9x}	0.54	X	3.29	x	62.67		0.63	x	0.7] =	88.39	(79)
Southwest _{0.9x}	0.54	X	1.05	х	85.75		0.63	x	0.7	=	38.6	(79)
Southwest _{0.9x}	0.54	X	3.29	x	85.75		0.63	x	0.7] =	120.93	(79)
Southwest _{0.9x}	0.54	X	1.05	x	106.25		0.63	X	0.7	=	47.82	(79)
Southwest _{0.9x}	0.54	X	3.29	x	106.25		0.63	x	0.7	=	149.84	(79)
Southwest _{0.9x}	0.54	X	1.05	x	119.01		0.63	X	0.7	=	53.56	(79)
Southwest _{0.9x}	0.54	X	3.29	х	119.01		0.63	X	0.7	=	167.84	(79)
Southwest _{0.9x}	0.54	X	1.05	x	118.15		0.63	x	0.7	=	53.18	(79)
Southwest _{0.9x}	0.54	X	3.29	x	118.15		0.63	X	0.7	=	166.62	(79)
Southwest _{0.9x}	0.54	X	1.05	x	113.91		0.63	X	0.7	=	51.27	(79)
Southwest _{0.9x}	0.54	X	3.29	х	113.91		0.63	x	0.7	=	160.64	(79)
Southwest _{0.9x}	0.54	X	1.05	x	104.39		0.63	x	0.7] =	46.98	(79)
Southwest _{0.9x}	0.54	X	3.29	x	104.39		0.63	x	0.7] =	147.22	(79)
Southwest _{0.9x}	0.54	X	1.05	x	92.85		0.63	x	0.7] =	41.79	(79)
Southwest _{0.9x}	0.54	X	3.29	x	92.85		0.63	x	0.7	j =	130.95	(79)
Southwest _{0.9x}	0.54	X	1.05	х	69.27		0.63	x	0.7] =	31.18	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27		0.63	x	0.7] =	97.69	(79)
Southwest _{0.9x}	0.54	X	1.05	х	44.07]	0.63	x	0.7	j =	19.84	(79)
Southwest _{0.9x}	0.54	X	3.29	х	44.07		0.63	x	0.7] =	62.15	(79)
_		_		-		-		-		-		

Southwest _{0.9x}	0.54	x	1.0)5	x 3	31.49	1 [0.63	x	0.7	=	14.17	(79)
Southwest _{0.9x}	0.54	x	3.2	29	x 3	31.49	Ī	0.63	_ x [0.7	_ =	44.41	(79)
_													_
Solar <u>g</u> ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m			_	
83)m= 92.03	164.59	246	339.67	412.29	423.3	402.28	345.97	278.1	187.51	111.65	77.83		(83)
Fotal gains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts	,			,		•	
84)m= 571.56	641.75	707.49	775.86	822.57	808.9	772.04	722.26	667.58	602.53	555.95	544.28		(84)
7. Mean inter	nal temp	perature	(heating	season)								
Temperature	during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)							_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
86)m= 1	1	0.99	0.96	0.86	0.67	0.49	0.55	0.82	0.98	1	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)	-	-	-	•	
37)m= 20.11	20.23	20.43	20.69	20.89	20.98	21	21	20.94	20.68	20.35	20.08]	(87)
Temperature	during h	neating n	ariade ir	rest of	dwelling	from Ta	hla 0 T	h2 (°C)	!	•	Į.	J	
88)m= 20.19	20.19	20.19	20.2	20.2	20.21	20.21	20.21	20.21	20.2	20.2	20.19	1	(88)
,		<u>!</u>		ļ		<u> </u>	<u> </u>					J	, ,
Utilisation fac	tor for g			welling, 0.82	h2,m (se 0.59	0.41	9a) 0.46	0.75	0.96	1 1	1	1	(89)
		0.99	0.95	<u> </u>		<u> </u>	ļ	0.75	<u> </u>		']	(00)
Mean interna				i	- ` `	1	i 			1	i	1	
90)m= 18.98	19.16	19.45	19.83	20.1	20.2	20.21	20.21	20.16	19.83	19.34	18.95		(90) —
								1	rla = Livin	ng area ÷ (4	4) =	0.47	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2				_	
92)m= 19.51	19.67	19.91	20.24	20.48	20.57	20.58	20.58	20.53	20.23	19.82	19.49		(92)
Apply adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate		1	1	
93)m= 19.51	19.67	19.91	20.24	20.48	20.57	20.58	20.58	20.53	20.23	19.82	19.49		(93)
8. Space hea													
Set Ti to the I					ned at st	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-cal	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisation fac	ļ		•	ividy	l oun	<u> </u>	_ /tag	_ <u> </u>	1 001	1400	_ <u></u>	J	
94)m= 1	0.99	0.98	0.95	0.84	0.63	0.45	0.5	0.78	0.96	0.99	1]	(94)
Useful gains,	hmGm	, W = (94	1)m x (8	4)m	l	1			ļ		ļ	1	
95)m= 570.15	638.22	696.75	734.98	687.45	508.89	345.84	361.47	521.51	581.07	552.74	543.28	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	e for mea	an intern	al tempe	erature,	Lm , W :	=[(39)m	x [(93)m	– (96)m]	-		<u>.</u>	
97)m= 1363.51	1320.1	1196.34	999.65	772.19	520.14	346.96	363.65	562.56	847.62	1123.98	1357.25		(97)
Space heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	•	•	
98)m= 590.26	458.22	371.7	190.56	63.05	0	0	0	0	198.31	411.29	605.59		_
							Tota	ıl per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2888.98	(98)
Space heatin	g require	ement in	kWh/m²	² /year								28.24	(99)
a. Energy red	quir <u>emer</u>	nts – Indi	vid <u>ual h</u>	eating s	vstems i	ncluding	micro-C	CHP)					
Space heatir													
Fraction of sp	•	at from se	econdar	y/supple	mentary	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) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating	system	າ, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)	0			0	100.01	444.00	005.50	1	
590.26 458.22 371.7 190.56 63.05	0	0	0	0	198.31	411.29	605.59		(044)
$ (211) m = \{ [(98) m x (204)] \} x 100 \div (206) $	0	0	0	0	212.09	439.88	647.69	1	(211)
[55:25] 1556 55:15 2505 5:15	Ţ.	, and the second				211),5,1012		3089.81	(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	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating Output from water heater (calculated above)									
213.64 188.31 197.78 177.31 173.77	155.29	149.16	163.65	163.35	183.86	194.39	208.5		
Efficiency of water heater								79.8	(216)
(217)m= 87.39 87.1 86.47 85.01 82.39	79.8	79.8	79.8	79.8	85.02	86.77	87.5		(217)
Fuel for water heating, kWh/month									
(219) m = (64) m x $100 \div (217)$ m								7	
(219)m= 244.48 216.2 228.71 208.59 210.9	194.6	186.91	205.07	204.7	216.27	224.04	238.3		
(219)m= 244.48 216.2 228.71 208.59 210.9	194.6	186.91		204.7 I = Sum(2		224.04	238.3	2578.77	(219)
Annual totals	194.6	186.91			19a) ₁₁₂ =	224.04 Wh/year	<u>I</u>	2578.77 kWh/yea i	
	194.6	186.91			19a) ₁₁₂ =		<u>I</u>		
Annual totals	194.6	186.91			19a) ₁₁₂ =		<u>I</u>	kWh/yeai	
Annual totals Space heating fuel used, main system 1		186.91			19a) ₁₁₂ =		<u>I</u>	kWh/yeai 3089.81	
Annual totals Space heating fuel used, main system 1 Water heating fuel used		186.91			19a) ₁₁₂ =		<u>I</u>	kWh/yeai 3089.81	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot		186.91			19a) ₁₁₂ =			kWh/yeai 3089.81	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:		186.91	Tota		19a) ₁₁₂ = k 1	Wh/year	30	kWh/yeai 3089.81	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue		186.91	Tota	I = Sum(2	19a) ₁₁₂ = k 1	Wh/year	30	kWh/yeai 3089.81 2578.77	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Tota	I = Sum(2:	19a) ₁₁₂ = k 1	Wh/year	30	kWh/yeai 3089.81 2578.77	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ms inclu	uding mi	Tota	I = Sum(2:	19a) ₁₁₂ = k 1	Wh/year	30 45	kWh/yeai 3089.81 2578.77 75 435.56	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ms inclu	uding mi	Tota	I = Sum(2:	19a) ₁₁₂ = k¹(230g) =	Wh/year	30 45	kWh/year 3089.81 2578.77 75 435.56	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	ms inclu En kW	uding mi	Tota	I = Sum(2:	(230g) =	Wh/year	30 45	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	ms inclu En kW (211	uding mi ergy /h/year	Tota	I = Sum(2: of (230a).	(230g) = Emiss kg CO:	ion fac 2/kWh	30 45	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/year	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ms inclu En kW (214 (218	uding mi ergy /h/year	Tota	I = Sum(2: of (230a).	(230g) = Emiss kg CO: 0.5	ion fac 2/kWh	30 45 tor =	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4	(230c) (230e) (231) (232) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ms inclu En kW (211 (218 (218	uding midergy /h/year	sum	I = Sum(2:	(230g) = Emiss kg CO:	ion fac 2/kWh	30 45 tor	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4 0	(230c) (230e) (231) (232) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	ms inclu En kW (211 (215 (215 (262	uding midergy /h/year 1) × 5) × 2) × 1) + (262)	Tota	I = Sum(2:	(230g) = Emiss kg CO: 0.5	ion fac 2/kWh	30 45 tor = =	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4 0 557.01	(230c) (230e) (231) (232) (232) (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ms inclu En kW (211) (215) (261) (261)	uding midergy /h/year	sum	I = Sum(2:	(230g) = Emiss kg CO: 0.5	ion fac 2/kWh	30 45 tor =	kWh/year 3089.81 2578.77 75 435.56 Emissions kg CO2/ye 667.4 0	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1489.39 (272)

TER = 21.14 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:45

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 81.5m2

Site Reference: **Plot Reference:** 4_05 - 1B2P **Tottenham Mews**

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

26.09 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 13.77 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 54.4 kWh/m²

Fail

Excess energy = $4.66 \text{ kg/m}^2 (09.4 \%)$

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70) **OK** Floor (no floor)

Roof

0.23 (max. 0.20) 0.23 (max. 0.35) Fail **Openings** 1.10 (max. 2.00) 1.10 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: Cylinderstat **OK**

OK

Regulations Compliance Report

Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	OK
MVHR efficiency:	78%	
Minimum	70%	OK
Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
sed on:		
Overshading:	Average or unknown	
Windows facing: North East	4.7m²	
Windows facing: South West	6.58m²	
Windows facing: South West	2.1m²	
Ventilation rate:	6.00	
Blinds/curtains:	Dark-coloured curtain or roller	· blind
	Closed 100% of daylight hour	S
0 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from electric heat pump		

Photovoltaic array

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	- 036 F1	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.5.12	
A 1.1	į.	Property	Address	: 4_05 -	1B2P				
Address: 1. Overall dwelling dime	ensions:								
1. Overall aweiling aime	, , , , , , , , , , , , , , , , , , ,	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		.65	(2a) =	215.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	81.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	215.98	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	x 4	10 =	0	(6a)
Number of open flues	0 + 0	- +	0		0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x 1	10 =	0	(7a)
Number of passive vents	3			F	0	x 1	10 =	0	(7b)
Number of flueless gas f	ires			F	0	x 4	10 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)
Number of storeys in t	peen carried out or is intended, proced he dwelling (ns)	ed to (17),	otnerwise (continue ti	rom (9) to	(16)		0	(9)
Additional infiltration	ine arraining (ine)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
**	resent, use the value corresponding t	o the grea	ter wall are	a (after			!		
deducting areas of openia	ngs);).1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(000	July, 5.55	00.				0	(13)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	ea		(20) = 1 -	[0.075 x (′	19)] =			0.7	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		-71			0.7	(21)
Infiltration rate modified f			, , ,	, , ,				0.1	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	1 -					ı	
(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 (OC.)	0)	•	•	•	•	-		•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1 1	1.08	1.12	1.18]	
(220)111= 1.21 1.20	1.20 1.1 1.00 0.95	0.95	0.92		1.00	1.12	1.10	J	

Adjusted infiltra		<u>`</u>				` 	`´	`´	I	l	T	1	
0.13 Calculate effec	0.13 ctive air	0.13 change i	0.12 rate for t	0.11 he appli	0.1 Cable ca	0.1 S e	0.1	0.1	0.11	0.12	0.12]	
If mechanica		•		ie appii	00.070 00.							0.5	(23
If exhaust air he	eat pump	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	or in-use f	actor (fron	n Table 4h) =				66.3	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29		(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	overy (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 h				•	•								
if (22b)n		<u> </u>	· ·	, ,			ŕ	ŕ –	· ` ·		1	1	(0
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n				•	•				0.51				
24d)m= 0	0	0	0	0	0	0	0.5 + [(2	0	0.01	0	0	1	(24
Effective air												J	•
25)m= 0.3	0.3	0.3	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.29	0.29	1	(25
0.0	0.0	0.0	0.20	0.20	0.27	0.27	0.27	0.27	0.20	0.20	0.20	J	(
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros area	-	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
Vindows Type		(111-)	111		4.7		۷۷/۱۱۱ <u>۷</u> +(1.1)/[]/		4.95		KJ/III	IX.	(27
Vindows Type Vindows Type						_	/[1/(1.1)+			\dashv			•
Vindows Type Vindows Type					3.29	_			3.47	=			(27
• •		. 1			1.05		/[1/(1.1)+		1.11	륵 ,			(27
Valls Type1	50.4		13.38	3	37.02	=	0.2	=	7.4	닠 ¦		- -	(29
Valls Type2	20.4	_	0	_	20.4	×	0.19	=	3.78	닠 !			(29
Roof	81.		0		81.5	X	0.23	=	18.75	[(30
otal area of e					152.3								(31
for windows and * include the area						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	h 3.2	
abric heat los				o ana pan			(26)(30)) + (32) =				44.02	2 (33
leat capacity		•	-,					((28).	(30) + (32	2) + (32a).	(32e) =	733.5	
hermal mass	`	,	o = Cm ÷	- TFA) ir	n kJ/m²K				tive Value	, , ,	(= = 7	100	(35
or design assess	•	•		•			ecisely the				able 1f	100	(00
an be used inste						,	,						
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						22.85	(36
details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =			66.87	(37
entilation hea	at loss ca		l monthly						= 0.33 × (25)m x (5)) 	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 21.55	21.36	21.18	20.24	20.05	19.12	19.12	18.93	19.49	20.05	20.43	20.8]	(38
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		-	
39)m= 88.42	88.23	88.05	87.11	86.92	85.99	85.99	85.8	86.36	86.92	87.3	87.67		
									Δ	Sum(39) ₁	140	87.06	39 (39

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.08	1.08	1.08	1.07	1.07	1.06	1.06	1.05	1.06	1.07	1.07	1.08		
				l .			l .		Average =	Sum(40) ₁	12 /12=	1.07	(40)
Number of day	<u> </u>	nth (Tab	le 1a)		1	ı		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 requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		49		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target c		3.35		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea			ctor from	Table 1c x		! '	!	!			
(44)m= 102.69	98.96	95.22	91.49	87.75	84.02	84.02	87.75	91.49	95.22	98.96	102.69		
		•		!			!			ım(44) ₁₁₂ =	L	1120.25	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,ı	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 152.29	133.19	137.44	119.82	114.97	99.21	91.94	105.5	106.76	124.42	135.81	147.48		_
If instantaneous v	vater heati	na at noint	of use (no	n hot water	r storage)	enter () in	hoves (46		Total = Su	ım(45) ₁₁₂ =	- [1468.83	(45)
	i		·		· ·		· · ·	, , , I	1,000	00.07	00.40		(46)
(46)m= 22.84 Water storage	19.98 loss:	20.62	17.97	17.25	14.88	13.79	15.82	16.01	18.66	20.37	22.12		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110) litres in	(47)						
Otherwise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					(1.14.4)								
a) If manufact				or is kno	wn (kVVI	n/day):				2.	24		(48)
Temperature f										0	.6		(49)
Energy lost from b) If manufact		•			or io not		(48) x (49)) =		1.	34		(50)
Hot water stor			-								0		(51)
If community h	-			•		,							` '
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								1.	34		(55)
Water storage	loss cal	culated t	for each	month	_		((56)m = ((55) × (41)	m				
(56)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Appendi	хН	
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	t 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	olar wa	ter 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 month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	culated 0	for each	montn ((61)m =	(60) ÷ 3	05 × (41))m 0	0	0	0	0		(61)
				<u> </u>				<u> </u>	<u> </u>		<u> </u>	(F0)m + (G1)m	(01)
Total heat requ (62)m= 217.21	191.83	202.37	182.66	179.9	162.05	156.86	170.42	·	189.34	198.64	212.41	(59)111 + (61)111	(62)
Solar DHW input c				l		<u> </u>							(02)
(add additional									ir contribu	iion io waie	er neaung)		
(63)m= 0	0	0	0	0	0	0	0	To	0	0	0		(63)
Output from wa													, ,
(64)m= 217.21	191.83	202.37	182.66	179.9	162.05	156.86	170.42	169.59	189.34	198.64	212.41		
` '							Οι	t tput from w	ater heate	. I er (annual)₁	112	2233.28	(64)
Heat gains fror	n water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)	ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 102.58	91.2	97.64	90.11	90.17	83.25	82.51	87.02	85.76	93.31	95.42	100.98	ĺ	(65)
include (57)r	n in calc	culation o	of (65)m	only if c	vlinder i	s in the o	dwellin	or hot w	/ater is f	rom com	ımunitv h	ı ıeatina	
5. Internal ga					,						,		
Metabolic gains	Ì			, ·									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	+	124.54	124.54	124.54		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5			•	l	
(67)m= 20.93	18.59	15.12	11.45	8.56	7.22	7.81	10.15	13.62	17.29	20.18	21.51		(67)
Appliances gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5	.		ı	
(68)m= 222.55	224.86	219.04	206.65	191.01	176.31	166.49	164.18		182.39	198.03	212.73		(68)
Cooking gains	(calcula	ted in A	pendix	L, equat	ion L15	or L15a), also s	see Table	5			·	
(69)m= 35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45		(69)
Pumps and far	ns gains	(Table 5	īa)					•				ı	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (nega	ive valu	es) (Tab	le 5)	•	•	•		•	•	•	
(71)m= -99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63		(71)
Water heating	gains (T	able 5)		•		•	•	•	•	•	•	•	
(72)m= 137.87	135.71	131.24	125.15	121.2	115.63	110.9	116.96	119.11	125.42	132.53	135.72		(72)
Total internal	gains =				(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	•	
(73)m= 441.71	439.52	425.75	403.6	381.12	359.53	345.56	351.65	363.09	385.46	411.1	430.32		(73)
6. Solar gains	t .					•	•	•	,	,	•		
Solar gains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to the	ne applical	ole orienta	tion.		
Orientation: A		actor	Area		Flu			g_ T-1-1-01-	-	FF		Gains	
	able 6d		m²			ble 6a	_	Table 6b	_	able 6c		(W)	_
Northeast _{0.9x}	0.54	X	4.	7	X ·	11.28	x	0.44	X	8.0	=	9.07	(75)
Northeast _{0.9x}	0.54	X	4.	7	x	22.97	x	0.44	X	0.8	=	18.47	(75)
Northeast _{0.9x}	0.54	X	4.	7	X Z	11.38	х	0.44	x	0.8	=	33.27	(75)
Northeast _{0.9x}	0.54	Х	4.	7	x (67.96	x	0.44	X	0.8	=	54.64	(75)
Northeast _{0.9x}	0.54	X	4.	7	X 9	91.35	x	0.44	X	0.8	=	73.45	(75)

Northeast _{0.9x}	0.54	x	4.7	1 x	97.38	7 x	0.44	コ x [0.8		78.3	(75)
Northeast 0.9x	0.54	^ x	4.7] ^] x	91.1	」 ^] x	0.44	_ ^	0.8		73.25	(75)
Northeast _{0.9x}	0.54	l ^	4.7] ^] x	72.63	」 ^] x	0.44	^ L □	0.8		58.39	(75)
Northeast _{0.9x}	0.54	x	4.7] ^] _x	50.42	」 ^] x	0.44	^ L □ x [0.8		40.54	(75)
Northeast _{0.9x}	0.54	X	4.7] x	28.07] x	0.44		0.8		22.57	(75)
Northeast _{0.9x}	0.54	X	4.7	X	14.2] x	0.44	x [0.8		11.41	(75)
Northeast 0.9x	0.54	X	4.7] x	9.21] x	0.44		0.8		7.41	(75)
Southwest _{0.9x}	0.54	X	3.29]]	36.79] 	0.44		0.8		41.42	(79)
Southwest _{0.9x}	0.54	X	1.05]]	36.79	1	0.44		0.8	_	13.22	(79)
Southwest _{0.9x}	0.54	X	3.29]] _X	62.67	1	0.44		0.8	= -	70.55	(79)
Southwest _{0.9x}	0.54	X	1.05]] _X	62.67	i	0.44		0.8	=	22.52	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75	1	0.44		0.8	= =	96.53	(79)
Southwest _{0.9x}	0.54	X	1.05	X	85.75	i	0.44		0.8	= =	30.81	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25	1	0.44		0.8	_ =	119.6	(79)
Southwest _{0.9x}	0.54	X	1.05	X	106.25	i	0.44		0.8	=	38.17	(79)
Southwest _{0.9x}	0.54	X	3.29	X	119.01	i	0.44		0.8		133.96	(79)
Southwest _{0.9x}	0.54	X	1.05	X	119.01	i	0.44	x [0.8	=	42.75	(79)
Southwest _{0.9x}	0.54	х	3.29	X	118.15	1	0.44	x [0.8	=	133	(79)
Southwest _{0.9x}	0.54	х	1.05	X	118.15	i	0.44		0.8	=	42.45	(79)
Southwest _{0.9x}	0.54	х	3.29	X	113.91	Ī	0.44	_ x [0.8	=	128.22	(79)
Southwest _{0.9x}	0.54	х	1.05	X	113.91	i	0.44		0.8	=	40.92	(79)
Southwest _{0.9x}	0.54	х	3.29	X	104.39	Ī	0.44		0.8		117.51	(79)
Southwest _{0.9x}	0.54	x	1.05	X	104.39	Ī	0.44	= x [0.8		37.5	(79)
Southwest _{0.9x}	0.54	х	3.29	X	92.85	Ī	0.44		0.8		104.52	(79)
Southwest _{0.9x}	0.54	х	1.05	X	92.85	Ī	0.44	_ x [0.8	_ =	33.36	(79)
Southwest _{0.9x}	0.54	х	3.29	x	69.27	Ī	0.44	x	0.8	=	77.97	(79)
Southwest _{0.9x}	0.54	x	1.05	X	69.27	Ī	0.44	x [0.8	=	24.88	(79)
Southwest _{0.9x}	0.54	x	3.29	X	44.07	Ī	0.44	_ x [0.8	=	49.61	(79)
Southwest _{0.9x}	0.54	x	1.05	X	44.07	Ī	0.44	= x [0.8	=	15.83	(79)
Southwest _{0.9x}	0.54	x	3.29	X	31.49	Ī	0.44	= x [0.8	<u> </u>	35.44	(79)
Southwest _{0.9x}	0.54	x	1.05	X	31.49	Ī	0.44	_ x [0.8	=	11.31	(79)
				•		_						
Solar gains in wat	ts, calcula	ated	for each mon	th		(83)n	n = Sum(74)m .	(82)m			1	
` '	1.53 160		212.41 250.1		253.74 242.39	21:	3.4 178.42	125.42	76.86	54.17		(83)
Total gains – inter		_	` 	_	<u> </u>	_					l	
(84)m= 505.42 55	1.05 586	.36	616.02 631.2	9 (513.27 587.95	565	5.05 541.51	510.88	487.96	484.49		(84)
7. Mean internal	temperati	ure (heating seaso	on)								
Temperature dur	ing heatir	ng pe	eriods in the li	ving	area from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation factor	for gains	for li	ving area, h1,	m (s	see Table 9a)						ı	
	_	ar	Apr Ma	_	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.96 0.	.95 0.9	3	0.89 0.82		0.69 0.56	0.5	59 0.77	0.9	0.95	0.97		(86)
Mean internal ter	nperature	in li	ving area T1	(foll	ow steps 3 to	7 in 7	able 9c)					
(87)m= 18.78 18	3.99 19.3	36	19.86 20.34		20.72 20.89	20.	86 20.59	19.99	19.31	18.74		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
1 emp (88)m=	erature 20.01	20.02	20.02	20.03	20.03	20.04	20.04	20.04	n2 (°C) 20.03	20.03	20.02	20.02		(88)
` ' I		<u> </u>	ains for				<u>!</u>	ļ	20.03	20.03	20.02	20.02		(00)
(89)m=	0.96	0.94	0.92	0.87	0.78	0.63	0.46	0.5	0.71	0.88	0.94	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m=	17.04	17.34	17.88	18.6	19.26	19.76	19.96	19.94	19.61	18.8	17.81	16.99		(90)
'								Į.	1	fLA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = f	LA × T1	+ (1 – fL	.A) × T2			·		_
(92)m=	17.89	18.15	18.6	19.22	19.79	20.23	20.41	20.39	20.09	19.38	18.55	17.85		(92)
	adjustn		he mear				m Table	4e, whe	ere appro	opriate				
(93)m=	17.89	18.15	18.6	19.22	19.79	20.23	20.41	20.39	20.09	19.38	18.55	17.85		(93)
		·	uirement											
			ternal ter or gains			ed at st	ep 11 of	Table 9	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:										
(94)m=	0.94	0.93	0.9	0.85	0.77	0.64	0.5	0.54	0.72	0.86	0.92	0.95		(94)
		1	, W = (9 ²	<u> </u>			ı	<u> </u>	ı	ı				(0.5)
(95)m=	476.17	510.65	527.89	524.65	486.44	393.87	295.3	302.58	387.96	438.44	450.03	458.98		(95)
(96)m=	11y avera	age exte	rnal tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern								,,,			()
		1169.08			703.24	484.22	328	342.59	517.66	763.55	999.32	1196.44		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	540	442.47	400.1	269.24	161.3	0	0	0	0	241.88	395.49	548.67		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2999.15	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								36.8	(99)
9b. Ene	ergy rec	quiremer	nts – Cor	nmunity	heating	scheme)							
			ace hea								unity sch	neme.		(301)
				•	• •	•		Table I	1) 0 11 11	OHE			0	╡```
	•		from co	•	•	•	•						1	(302)
	-		y obtain he s, geotherr							up to four (other heat	sources; ti	ne latter	
			Commun			от рото	otalionoi						1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump	0			(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space	heating	g											kWh/yeaı	- ∙
-		_	requirem	nent									2999.15	
Space	heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) =	=	3149.11	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												'		

				Γ	٦
Space heating requirement from second	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2233.28	
If DHW from community scheme: Water heat from Community heat pump)	(64) x (303a) x	(305) x (306) =	2344.95	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	54.94	(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	· ,	side		158.09	(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	158.09	(331)	
Energy for lighting (calculated in Appen	dix L)			369.64	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-618.34	(333)
Electricity generated by wind turbine (A	ppendix M) (negative quanti	ty)		0	(334)
12b. CO2 Emissions – Community heat	ting scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)	vater heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year	(367a)
•	If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year](367a)](367)
Efficiency of heat source 1 (%)	If there is CHP using two	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue	250 1140.57	_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using two [(307b)+(310l)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.52 = 0.52 =	250 1140.57 28.51	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	[(307b)+(310l) [(313systems (363)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x c) x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.52 = 0.52 =	250 1140.57 28.51 1169.08	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	[(307b)+(310l) [(313systems (363)) (309)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x c) x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.52 = 0.52 =	250 1140.57 28.51 1169.08	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	If there is CHP using two [(307b)+(310l) [(313 systems (363) condary) (309) sion heater or instantaneous	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x c) x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 =	250 1140.57 28.51 1169.08	(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 s CO2 associated with space heating (se	If there is CHP using two [(307b)+(310l) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373)	fuels repeat (363) to (b)] x 100 ÷ (367b) x (c) x (c) (366) + (368)(372) (d) x (e) heater (312) x (e) + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 =	250 1140.57 28.51 1169.08 0 1169.08	(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 s CO2 associated with space heating (se CO2 associated with water from immers Total CO2 associated with space and w	If there is CHP using two [(307b)+(310l) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling	fuels repeat (363) to (b)] x 100 ÷ (367b) x (c) x (c) (366) + (368)(372 (d) x (e) heater (312) x (e) + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 1140.57 28.51 1169.08 0 1169.08 82.05	(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 s CO2 associated with space heating (se CO2 associated with water from immers Total CO2 associated with space and w CO2 associated with electricity for pum	If there is CHP using two [(307b)+(310l) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332)	fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x)) x	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 1140.57 28.51 1169.08 0 1169.08 82.05	(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 source 1 CO2 associated with space heating (see CO2 associated with water from immersor 1 Total CO2 associated with space and work CO2 associated with electricity for pumple CO2 associated with electricity for lighting Energy saving/generation technologies	If there is CHP using two [(307b)+(310l) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332)	fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x)) x	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 1140.57 28.51 1169.08 0 1169.08 82.05 191.85	(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 source 1 CO2 associated with space heating (see CO2 associated with water from immersor 1 Total CO2 associated with space and work 1 CO2 associated with electricity for pumple CO2 associated with electricity for lighting 1 Energy saving/generation technologies litem 1	If there is CHP using two [(307b)+(310l) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332) (333) to (334) as applicable	fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x)) x	kg CO2/kWh (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 1140.57 28.51 1169.08 0 1169.08 82.05 191.85	(367) (372) (373) (374) (375) (376) (378) (379)

			User D	Notaile:						
	\". F = T		USELL					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 20 ⁷	12		Strom: Softwa					018096 on: 1.0.5.12	
Software Hame.	Stroma i S/ti 20		operty	Address				VCISIC	71. 1.0.0.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	7(0-)	Volume(m ³	<u>-</u>
	\	\ /4			(1a) x	2	2.65	(2a) =	215.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	81.5	(4)					_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	215.98	(5)
2. Ventilation rate:	main s	econdary	v	other		total			m³ per hou	ır
N. selven of all leaves a	heating	heating	-		, –			40		_
Number of chimneys	0 +	0] +	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] + _	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	3	X '	10 =	30	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	6a)+(6b)+(7a	a)+(7b)+(7c) =	Г	30		÷ (5) =	0.14	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.14	(0)
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber present, use the value corres				•	ruction			0	(11)
deducting areas of openi		sponding to	irie great	er wan 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, en	ter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	, ,	_	4		0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,	· ·		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil Air permeability value applie						is boing u	end		0.39	(18)
Number of sides sheltere		is been done	e or a de	gree all per	теаышу	is being u	360		4	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.27	(21)
Infiltration rate modified f	or monthly wind spee	d								
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									
<u> </u>	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
								<u> </u>	J	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32]		
Calculate effect		•	rate for t	he appli	cable ca	se				•				٦,,,,,
If exhaust air he			andiv N (2	3h) - (23s	a) × Fmv (e	auation (N	JS)) other	rwisa (23h) <i>- (</i> 23a)			0		(23a
If balanced with		•	,	, ,	,	•	,,	,) = (23a)			0](23k
a) If balance		•	•	J		`		,	2h\m ı (22h) v [1 (220)	0 . 1001		(230
(24a)m= 0	0	o 0	0	0	0	0	1K) (24a	0	0	230) x [0] - 100]		(24a
b) If balance					, i							J		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(24b
c) If whole h		<u> </u>				<u> </u>	<u> </u>	<u> </u>				J		•
if (22b)n					•				.5 × (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(240
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft	l					
if (22b)n	n = 1, the	en (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	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			(240
Effective air	change	rate - er	iter (24a) or (24b	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]		(25)
3. Heat losse	s and he	eat loss r	paramet	er:										
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	ΑXU		k-value	9	ΑХ	k
	area	(m²)	· m) ²	A ,r	n²	W/m2	K .	(W/	K)	kJ/m²-	K	kJ/K	
Windows Type	: 1				4.7	x1,	/[1/(1.4)+	0.04] =	6.23					(27)
Windows Type	2				3.29	x1,	/[1/(1.4)+	0.04] =	4.36					(27)
Windows Type	: 3				1.05	x1,	/[1/(1.4)+	0.04] =	1.39					(27)
Walls Type1	50.4	4	13.3	8	37.02	<u>x</u>	0.18	= [6.66					(29)
Walls Type2	20.4	4	0		20.4	Х	0.18	=	3.67					(29)
Roof	81.5	5	0		81.5	х	0.13	=	10.59			\neg		(30)
Total area of e	lements	, m²			152.3	3								- (31)
* for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2		
** include the area				ls and par	titions		(2.2)	(2.5)						,
Fabric heat los		•	U)				(26)(30)					38.6	57	(33)
Heat capacity	`	,							(30) + (32	, , ,	(32e) =	733	.5](34)
Thermal mass	-								tive Value			250)	(35)
For design assess can be used inste				construct	ion are not	t known pr	ecisely the	indicative	values of	'IMP IN I	able 1f			
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						7.6	 2	(36)
if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									٦, ,
Total fabric he	at loss							(33) +	(36) =			46.2	!8	(37)
Ventilation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × ((25)m x (5))	•		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 39.93	39.76	39.6	38.83	38.69	38.02	38.02	37.9	38.28	38.69	38.98	39.28			(38)
Heat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m				
(39)m= 86.21	86.05	85.88	85.12	84.97	84.3	84.3	84.18	84.56	84.97	85.26	85.57			_
									Average =	Sum(39) ₁	12 /12=	85.1	2	(39)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.05	1.04	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05	ı	
` /				<u> </u>	<u> </u>	<u> </u>	<u> </u>		L Average =	Sum(40) ₁ .	12 /12=	1.04	(40)
Number of day	s in mo	nth (Tabl	le 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ı	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31	ı	(41)
<u> </u>													
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	nancy	NI									40	ı	(40)
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.		49		(42)
Annual average											.35	ı	(43)
Reduce the annua	-				-	-	to achieve	a water us	se target o	r ^t			
not more that 125	ilities per	person per T	uay (ali w		ioi and co							ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	ı litres pei	r day for ea	cn montn	Va,m = ta	ctor from	able 1c x	(43)					ı	
(44)m= 102.69	98.96	95.22	91.49	87.75	84.02	84.02	87.75	91.49	95.22	98.96	102.69		_
Financial and ad	h = 4= 4=			- mth-h	400 \/-/		T / 200/			m(44) ₁₁₂ =		1120.25	(44)
Energy content of	not water	usea - car			190 x va,r		1 m / 3600	KVVN/mor			c, 1a)	ı	
(45)m= 152.29	133.19	137.44	119.82	114.97	99.21	91.94	105.5	106.76	124.42	135.81	147.48		_
If instantaneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (16		Total = Su	m(45) ₁₁₂ =	= [1468.83	(45)
									1		i 1	ı	(10)
(46)m= 22.84 Water storage	19.98	20.62	17.97	17.25	14.88	13.79	15.82	16.01	18.66	20.37	22.12		(46)
Storage volum) includin	n anv so	olar or W	/WHRS	storane	within sa	ame ves	امء		150	ı	(47)
If community h	` '		-			•		A1110 VOO	001		130		(47)
Otherwise if no	•			•			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage		not wate	, (a.i.o ii	.0.4400 .	otairtai	.0000		0.0, 0	J. O (,			
a) If manufacti		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	65	ı	(48)
Temperature fa	actor fro	m Table	2b							0.	54	ı	(49)
Energy lost fro				ear			(48) x (49)) =			89	ı	(50)
b) If manufacti		_	-		or is not					0.	00		(00)
Hot water stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0	ı	(51)
If community h	_		on 4.3									ı	
Volume factor			0.1								0	ı	(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0	ı	(54)
Enter (50) or (54) in (5	55)								0.	89		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66	ı	(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= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0	ı	(58)
Primary circuit				,	•	. ,	, ,						
(modified by	factor f	rom Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		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	ı	(59)

Combi loog o	o louloto d	for ooob	manth ((64)m	(CO) + 2(SE (41)	١,,,,						
Combi loss of (61)m= 0	alculated	or each	month (0 1)m =	(60) ÷ 30	05 × (41)	0	Ιο	0	Ο	0	1	(61)
		ļ					<u> </u>	ļ	<u> </u>	ļ		(50) (61)	(01)
(62)m= 203.2		188.37	169.11	165.9	148.5	142.86	156.42	156.04	(45)III + 175.34	185.09	198.41	(59)m + (61)m 1	(62)
Solar DHW inpu						<u> </u>						l	(02)
(add addition									ii continbut	ion to wate	er rieatiriy)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	 water hea	ter					<u> </u>	<u> </u>	<u> </u>	ļ		I	, ,
(64)m= 203.2		188.37	169.11	165.9	148.5	142.86	156.42	156.04	175.34	185.09	198.41]	
						!	Out	put from w	ater heate	r (annual)₁	12	2068.44	(64)
Heat gains fi	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 ;	x [(46)m	+ (57)m	+ (59)m	 .]	
(65)m= 91.38		86.44	79.27	78.97	72.42	71.31	75.82	74.92	82.11	84.58	89.78	Ī	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	ı ıeating	
5. Internal	<u> </u>				•		J				,	,	
Metabolic ga	ins (Table	e 5), Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 124.5	4 124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54	124.54		(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-			
(67)m= 21.5 ²	19.13	15.56	11.78	8.81	7.43	8.03	10.44	14.02	17.8	20.77	22.14		(67)
Appliances of	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5		•	•	
(68)m= 222.5	5 224.86	219.04	206.65	191.01	176.31	166.49	164.18	170	182.39	198.03	212.73]	(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45	35.45		(69)
Pumps and f	ans gains	(Table 5	āa)					•	•	•		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)			•		•	•		
(71)m= -99.6	3 -99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63	-99.63		(71)
Water heating	g gains (1	rable 5)				•			•		•		
(72)m= 122.8	2 120.66	116.18	110.09	106.14	100.58	95.85	101.91	104.06	110.36	117.48	120.67		(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 430.2	7 428.01	414.14	391.88	369.32	347.68	333.73	339.89	351.44	373.91	399.64	418.9		(73)
6. Solar gai	ns:							1	•				
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ 	_	FF		Gains	
	Table 6d		m²		ı aı	ble 6a		able 6b	_ '	able 6c		(W)	
Northeast 0.9		X	4.	7	x 1	1.28	X	0.63	X	0.7	=	11.37	(75)
Northeast 0.9	0.54	X	4.	7	x 2	22.97	x	0.63	x	0.7	=	23.14	(75)
Northeast 0.9	0.54	X	4.	7	X 4	11.38	x	0.63	x	0.7	=	41.68	(75)
Northeast 0.9		Х	4.	7	x 6	67.96	x	0.63	x	0.7	=	68.45	(75)
Northeast 0.9	0.54	X	4.	7	X G	91.35	x	0.63	x	0.7	=	92.02	(75)

Northeast _{0.9x}		—		٦		٦		– 1				(75)
<u> </u>	0.54	X	4.7	X	97.38	X	0.63	×	0.7	=	98.1	(75)
Northeast _{0.9x}	0.54	×	4.7	」 X ¬	91.1	X	0.63	X	0.7	= =	91.77	(75)
<u> </u>	0.54	×	4.7	X	72.63	X	0.63	X	0.7	=	73.16	(75)
Northeast 0.9x	0.54	×	4.7	」 X ¬	50.42	X	0.63	×	0.7	=	50.79	(75)
Northeast 0.9x	0.54	×	4.7	X	28.07	X	0.63	X	0.7	=	28.27	(75)
Northeast _{0.9x}	0.54	X	4.7	X	14.2	X	0.63	X	0.7	=	14.3	(75)
Northeast 0.9x	0.54	X	4.7	X	9.21	X	0.63	X	0.7	=	9.28	(75)
Southwest _{0.9x}	0.54	X	3.29	X	36.79	_	0.63	X	0.7	=	51.89	(79)
Southwest _{0.9x}	0.54	X	1.05	X	36.79	╛	0.63	X	0.7	=	16.56	(79)
Southwest _{0.9x}	0.54	X	3.29	X	62.67	╛	0.63	X	0.7	=	88.39	(79)
Southwest _{0.9x}	0.54	X	1.05	X	62.67	_	0.63	X	0.7	=	28.21	(79)
Southwest _{0.9x}	0.54	X	3.29	X	85.75	╛	0.63	X	0.7	=	120.93	(79)
Southwest _{0.9x}	0.54	X	1.05	X	85.75		0.63	X	0.7	=	38.6	(79)
Southwest _{0.9x}	0.54	X	3.29	X	106.25		0.63	X	0.7	=	149.84	(79)
Southwest _{0.9x}	0.54	X	1.05	X	106.25		0.63	X	0.7	=	47.82	(79)
Southwest _{0.9x}	0.54	X	3.29	x	119.01		0.63	x	0.7	=	167.84	(79)
Southwest _{0.9x}	0.54	X	1.05	x	119.01		0.63	X	0.7	=	53.56	(79)
Southwest _{0.9x}	0.54	x	3.29	x	118.15		0.63	X	0.7	=	166.62	(79)
Southwest _{0.9x}	0.54	x	1.05	x	118.15	1	0.63	X	0.7	=	53.18	(79)
Southwest _{0.9x}	0.54	x	3.29	x	113.91	Ī	0.63	х	0.7		160.64	(79)
Southwest _{0.9x}	0.54	x	1.05	x	113.91	Ī	0.63	х	0.7	=	51.27	(79)
Southwest _{0.9x}	0.54	x	3.29	x	104.39	Ī	0.63	x	0.7	=	147.22	(79)
Southwest _{0.9x}	0.54	x	1.05	x	104.39	Ī	0.63	x	0.7	=	46.98	(79)
Southwest _{0.9x}	0.54	x	3.29	x	92.85	Ī	0.63	х	0.7	=	130.95	(79)
Southwest _{0.9x}	0.54	x	1.05	X	92.85	Ī.	0.63	x	0.7	=	41.79	(79)
Southwest _{0.9x}	0.54	x	3.29	x	69.27	Ī	0.63	x	0.7	=	97.69	(79)
Southwest _{0.9x}	0.54	x	1.05	X	69.27	Ī	0.63	x	0.7	_ =	31.18	(79)
Southwest _{0.9x}	0.54	×	3.29	X	44.07	i i	0.63	X	0.7		62.15	(79)
Southwest _{0.9x}	0.54	x	1.05	X	44.07	i i	0.63	x	0.7	=	19.84	(79)
Southwest _{0.9x}	0.54	x	3.29	X	31.49	i	0.63	x	0.7	=	44.41	(79)
Southwest _{0.9x}	0.54	×	1.05	X	31.49	┪	0.63	×	0.7		14.17	(79)
L				J		_						` ′
Solar gains in v	watts, calc	culated	for each mon	ıth		(83)n	n = Sum(74)m .	(82)m				
(83)m= 79.82		201.21	266.12 313.4	_	317.9 303.68	267	.36 223.53	157.13	96.29	67.86		(83)
Total gains – in	nternal and	d solar	(84)m = (73) r	n + (83)m , watts	•	•					
(84)m= 510.08	567.74	615.35	658 682.7	3 6	65.58 637.41	607	.25 574.97	531.04	495.92	486.76		(84)
7. Mean interr	nal tempe	rature (heating seas	on)								
Temperature		,			area from Ta	ıble 9	, Th1 (°C)				21	(85)
Utilisation fact	_	•		_			` '				<u> </u>	
Jan	Feb	Mar	Apr Ma	Ť	Jun Jul	1	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.97 0.9	`	0.75 0.57	0.6		0.97	0.99	1		(86)
Mean internal	temperat	ure in li	ving area T1	(follo	w stens 3 to	7 in ⁷	able 9c)				1	
(87)m= 19.91		20.25	20.54 20.79	`	20.95 20.99	20.		20.57	20.19	19.88		(87)
. ,						1		<u> </u>		<u> </u>	I	•

Tomp	oroturo	during h	ooting n	oriodo ir	root of	dwalling	from To	blo O T	h2 (°C)					
(88)m=	20.04	20.04	20.04	20.05	20.05	20.05	from Ta	20.06	20.05	20.05	20.05	20.04		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	wellina	h2 m (se	ee Table	9a)	l		<u>I</u>	<u> </u>		
(89)m=	1	0.99	0.98	0.95	0.86	0.66	0.45	0.5	0.78	0.96	0.99	1		(89)
Mean	internal	temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to ²	7 in Tabl	 e 9c)	ļ.			
(90)m=	18.58	18.77	19.08	19.49	19.84	20.02	20.05	20.05	19.96	19.55	18.99	18.55		(90)
, ,						<u> </u>	<u> </u>	<u> </u>	<u> </u>	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean	internal	l tampar	ature (fo	r the wh	ole dwe	lling) – f	LA × T1	⊥ (1 _ fl	Δ) ~ T2					
(92)m=	19.23	19.39	19.66	20.01	20.31	20.48	20.51	20.51	20.42	20.05	19.58	19.2		(92)
		nent to t	he mean	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.23	19.39	19.66	20.01	20.31	20.48	20.51	20.51	20.42	20.05	19.58	19.2		(93)
8. Spa	ace hea	ting requ	uirement											
						ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains		1	Ι.	l				l	_	1	
Litiliae	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	ation rac	0.99	ains, hm _{0.98}	0.95	0.87	0.7	0.51	0.56	0.81	0.96	0.99	1		(94)
			, W = (9 ²	l		0.7	0.01	0.00	0.01	0.50	0.00	'		(01)
(95)m=		563.24	604.56	627.06	595.51	465.84	325.42	338.89	467.18	510.64	491.68	485.16		(95)
			rnal tem	<u>L</u> perature	trom Ta	L able 8	<u> </u>	<u> </u>	<u> </u>		ļ			
(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]				
(97)m=	1287.33	1246.98	1129.94	945.28	731.33	495.32	329.8	345.88	534.17	802.79	1064.02	1283.7		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m		•	
(98)m=	579.86	459.47	390.88	229.12	101.05	0	0	0	0	217.36	412.09	594.11		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2983.94	(98)
Space	e heating	g require	ement in	kWh/m²	² /year								36.61	(99)
9a. En	ergy red	uiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ıg:					J							
Fracti	on of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	nt from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heatin	g systen	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space			ement (c		<u> </u>	L		19					, , , , ,	
•	579.86	459.47	390.88	229.12	101.05	0	0	0	0	217.36	412.09	594.11		
(211)m	n = {[(98])m x (20	4)] } x 1	00 ÷ (20)6)									(211)
,	620.17	491.41	418.05	245.05	108.08	0	0	0	0	232.47	440.73	635.41		
						!	!	Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	F	3191.38	(211)
Space	e heating	g fuel (s	econdar	y), kWh/	month									
•		•	00 ÷ (20										i	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)

Water heating								
Output from water heater (calculated above) 203.21 179.19 188.37 169.11 165.9 1	148.5 142.86	156.42	156.04	175.34	185.09	198.41]	
Efficiency of water heater				<u> </u>		<u> </u>	79.8	(216)
(217)m= 87.46 87.22 86.72 85.62 83.54	79.8 79.8	79.8	79.8	85.39	86.89	87.56		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•						•	
` '	86.09 179.03	196.02	195.54	205.35	213.02	226.59		_
		Tota	I = Sum(2	19a) ₁₁₂ =			2452.74	(219)
Annual totals				k\	Wh/year	•	kWh/year	٦
Space heating fuel used, main system 1							3191.38	_
Water heating fuel used							2452.74	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30]	(2300
boiler with a fan-assisted flue						45]	(230e
Total electricity for the above, kWh/year		sum	of (230a)	(230g) =			75	(231)
Electricity for lighting							380.45	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP	,					
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	689.34	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	529.79	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1219.13	(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	=	197.45	(268)
Total CO2, kg/year			sum c	of (265)(2	271) =		1455.51	(272)

TER =

(273)

26.09

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 *Printed on 24 November 2020 at 17:44:45*

Proiect Information:

Assessed By: Vitaliy Troyan (STRO018096) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 55.3m²

Site Reference: Tottenham Mews Plot Reference: 5_01 - 1B2P

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.81 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.82 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 51.5 kWh/m²

Fail

Excess energy = $0.91 \text{ kg/m}^2 (01.8 \%)$

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK

1.10 (max. 3.30)

Openings
2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

1.10 (max. 2.00)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs **OK**

Hot water controls: Cylinderstat OK

OK

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	ок
MVHR efficiency:	78%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	3.3m²	
Windows facing: South West	2.12m ²	
Windows facing: North West	7.28m ²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller bli	nd
	Closed 100% of daylight hours	
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	
Community heating, heat from electric heat pump		
,		

Photovoltaic array

User Details:	
Assessor Name: Vitaliy Troyan Stroma Number: STRO01	8096
Software Name: Stroma FSAP 2012 Software Version: Version:	
Property Address: 5_01 - 1B2P	
Address:	
1. Overall dwelling dimensions: Area(m²) Av. Height(m)	/olume(m³)
Ground floor 55.3 (1a) x 2.65 (2a) =	146.55 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55.3 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	146.55 (5)
2. Ventilation rate:	, ,
	n³ per hour
Number of chimneys $0 + 0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)
Number of intermittent fans 0 × 10 =	0 (7a)
Number of passive vents 0 × 10 =	0 (7b)
Number of flueless gas fires 0 × 40 =	0 (7c)
	ges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	0 (8)
Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped Window infiltration 0.25 - [0.2 x (14) ÷ 100] =	0 (14)
Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =	0 (15)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3 (17)
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 Shelter factor $(20) = 1 - [0.075 \times (19)] =$	3 (19) 0.78 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.12 (21)
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 $(22a)m = (22)m \div 4$	

0.15	0.15	e (allowi	ng for sr 0.13	0.12	a wina s	peea) = 0.11	(21a) X 0.11	(22a)m 0.12	0.12	0.13	0.14	1	
Calculate effec		l -		-		-	0.11	0.12	0.12	0.13	0.14]	
If mechanica	al ventila	ition:										0.5	(23
If exhaust air he	eat 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: effici	ency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				66.3	(23
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
24a)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31]	(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	overy (I	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)n		<u> </u>	,	, ,	 	,			· ` ·		T .	1	(0.
24c)m= 0	0	0		0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n									0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
Effective air	change	rate - er	ter (24a	or (24b	o) or (24	c) or (24	d) in box	к (25)				1	
25)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31	1	(25
					l		<u> </u>	<u> </u>				1	
3. Heat losse	_	·			NI a t A a		11 -1		A 37.1.1		1 -1		A 3/ I
LEMENT	Gros area	-	Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Vindows Type	1	,			1.65	_x 1	/[1/(1.1)+	0.04] =	1.74	,			(27
Vindows Type	2				2.12	x1	/[1/(1.1)+	0.04] =	2.23	一			(27
Vindows Type	3				3.64	x1	/[1/(1.1)+	0.04] =	3.84	=			(27
Valls Type1	43.	5	12.7		30.8	x	0.2		6.16	=			(29
Valls Type2	12.2	2	0	=	12.2	x	0.19	≓ <u>-</u> i	2.26	=		= =	(29
Roof	55.3		0	=	55.3		0.14	<u> </u>	7.74	=		-	(30
otal area of e					111	=	<u> </u>						(31
for windows and			ffective wi	ndow U-va		l ated usino	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	h 3.2	(0)
* include the area								, [(.,	,	J	,g p.		
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				29.54	(33
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	497.7	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35
or design assess				construct	ion are not	known pi	ecisely the	e indicative	values of	TMP in T	able 1f		
an be used inste hermal bridge				ıcina Δr	nandiv k	(40.05	
details of therma	•	•		• .	•	`						16.65	(36
otal fabric he		are not an	own (00) -	· 0.00 x (0	1)			(33) +	(36) =			46.19	(37
entilation 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= 15.32	15.18	15.04	14.33	14.19	13.49	13.49	13.35	13.77	14.19	14.47	14.75	1	(38
leat transfer o	coefficier	nt, W/K			•		•	(39)m	= (37) + (37)	38)m	•		
			60.53	60.38	59.68	59.68	59.54	59.96	60.38	60.67	60.95	1	
39)m= 61.51	61.37	61.23	00.55	00.50	00.00	00.00	00.0				00.00		

leat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
1.11 lo)m=	1.11	1.11	1.09	1.09	1.08	1.08	1.08	1.08	1.09	1.1	1.1		
lumber of day	e in moi	nth (Tah	le 1a)		•	•	•	,	Average =	Sum(40) ₁ .	12 /12=	1.09	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing enei	rgy 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.		85		(42)
nnual averag leduce the annua ot more that 125	l average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.05		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			•			
4)m= 85.85	82.73	79.61	76.49	73.36	70.24	70.24	73.36	76.49	79.61	82.73	85.85		— ,
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		936.55	(44
l5)m= 127.31	111.35	114.9	100.17	96.12	82.94	76.86	88.2	89.25	104.01	113.54	123.3		
									Total = Su	m(45) ₁₁₂ =	=	1227.97	(45
instantaneous w									1	ı			(4 6
Vater storage	16.7 loss:	17.24	15.03	14.42	12.44	11.53	13.23	13.39	15.6	17.03	18.49		(46
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200		(47
community h	•			•			` '						
Otherwise if no Vater storage		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/day):				2.	24		(48
emperature fa					,	• ,					.6		(49
nergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1.	34		(50
o) If manufact			-										-
lot water stora community h	•			e z (KVV	n/iitre/da	ıy)					0		(5
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)								1.	34		(5
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
66)m= 41.66 cylinder contains	37.63 dedicate	41.66 d solar sto	40.32 rage, (57)	41.66 m = (56)m	40.32 x [(50) – (41.66 H11)] ÷ (5	41.66 0), else (5	40.32 7)m = (56)	41.66 m where (40.32 H11) is fro	41.66 m Appendix	¢Η	(56
57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57
<i>'</i>		l .									0		(58
rimary circuit	loss cal	culated f	or each	month (•	. ,	, ,				<u> </u>		(30
(modified by					ı —	ı —		-		r í			
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	alculated	for each	month ((61)m =	(60) ÷ 3	65 × (41)m						
(61)m= 0	0	0	0	0	0	O	0	0	0	0	0	1	(61)
Total heat red	uired for	water he	eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 192.24	·	179.83	163.01	161.05	145.78	141.79	153.12		168.94	176.37	188.22]	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	H (nega	ive quantity	y) (enter	0' if no sola	r contribu	tion to wate	er heating)	J	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applies	s, see Ap	pendix	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	vater hea	ter						•	•		•	•	
(64)m= 192.24	169.99	179.83	163.01	161.05	145.78	141.79	153.12	152.08	168.94	176.37	188.22		
						•	Ou	tput from w	ater heate	er (annual)	112	1992.42	(64)
Heat gains fro	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 94.27	83.94	90.15	83.57	83.9	77.84	77.5	81.27	79.94	86.53	88.02	92.94		(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwellin	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso see	Table 5				•	
(67)m= 14.35	12.75	10.37	7.85	5.87	4.95	5.35	6.96	9.34	11.85	13.83	14.75		(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), als	o see Ta	ble 5			•	
(68)m= 160.96	162.63	158.42	149.46	138.15	127.52	120.42	118.75	122.95	131.92	143.23	153.86		(68)
Cooking gains	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	see Table	5		•	•	
(69)m= 32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23		(69)
Pumps and fa	ns gains	(Table 5	āa)									•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)			-			-	•	
(71)m= -73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85		(71)
Water heating	g gains (T	able 5)				-		•				•	
(72)m= 126.71	124.91	121.16	116.07	112.77	108.12	104.16	109.23	111.03	116.3	122.25	124.92		(72)
Total interna	l gains =				(66	5)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	•	
(73)m= 352.71	350.97	340.64	324.07	307.48	291.28	280.62	285.62	294.01	310.76	330	344.21]	(73)
6. Solar gain	is:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to th	ne applica		tion.		
Orientation:			Area		Flo	ux ible 6a		g_ Table 6b	т	FF		Gains	
	Table 6d		m²				, _	Table 6b	_ '	able 6c		(W)	_
Southwest _{0.9x}		X	1.6	35	X	36.79	ļ <u>L</u>	0.44	x	0.8	=	29.62	(79)
Southwest _{0.9x}	0.77	X	2.1	2	х	36.79	ļ L	0.44	x	0.8	=	19.03	(79)
Southwest _{0.9x}	0.77	X	1.6	S5	х	62.67	ļ <u>L</u>	0.44	x	0.8	=	50.45	(79)
Southwest _{0.9x}		X	2.1	2	x	62.67	ļ <u>Ļ</u>	0.44	x	0.8	=	32.41	(79)
Southwest _{0.9x}	0.77	X	1.6	S5	X	85.75		0.44	Х	0.8	=	69.03	(79)

								1			_				
Southwest _{0.9x}	0.77	X	2.1	2	X	8	35.75	_		0.44	X	0.8	=	44.35	(79)
Southwest _{0.9x}	0.77	Х	1.6	55	X	1	06.25	<u> </u>		0.44	X	0.8	=	85.53	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	06.25			0.44	X	0.8	=	54.95	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	19.01			0.44	X	0.8	=	95.8	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	19.01			0.44	X	0.8	=	61.55	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	18.15			0.44	X	0.8	=	95.11	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	18.15			0.44	X	0.8	=	61.1	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	13.91			0.44	X	0.8	=	91.7	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	1	13.91			0.44	X	0.8	=	58.91	(79)
Southwest _{0.9x}	0.77	X	1.6	55	X	1	04.39]		0.44	X	0.8	=	84.03	(79)
Southwest _{0.9x}	0.77	х	2.1	2	X	1	04.39]		0.44	x	0.8	=	53.98	(79)
Southwest _{0.9x}	0.77	х	1.6	55	X	9	2.85			0.44	x	0.8	=	74.74	(79)
Southwest _{0.9x}	0.77	X	2.1	2	X	9	2.85			0.44	x	0.8	=	48.02	(79)
Southwest _{0.9x}	0.77	x	1.6	55	X	6	9.27	Ī		0.44	x	0.8	_ =	55.76	(79)
Southwest _{0.9x}	0.77	x	2.1	2	X	6	9.27	ĺ		0.44	x	0.8	_ =	35.82	(79)
Southwest _{0.9x}	0.77	x	1.6	55	X	4	4.07	ĺ		0.44	×	0.8	=	35.48	(79)
Southwest _{0.9x}	0.77	х	2.1	2	X	4	4.07	ĺ		0.44	x	0.8	=	22.79	(79)
Southwest _{0.9x}	0.77	x	1.6	i5	X	3	31.49	ĺ		0.44	x	0.8	=	25.35	(79)
Southwest _{0.9x}	0.77	x	2.1	2	X	3	31.49	ĺ		0.44	×	0.8		16.28	(79)
Northwest _{0.9x}	0.77	x	3.6	64	X	1	1.28	х		0.44	x	0.8	=	20.04	(81)
Northwest 0.9x	0.77	x	3.6	64	X	2	2.97	x		0.44	x	0.8	=	40.79	(81)
Northwest _{0.9x}	0.77	x	3.6	64	X	4	1.38	x		0.44	×	0.8		73.48	(81)
Northwest _{0.9x}	0.77	X	3.6	64	X	6	7.96	x		0.44	x	0.8		120.68	(81)
Northwest 0.9x	0.77	x	3.6	64	X	9	1.35	х		0.44	x	0.8	=	162.22	(81)
Northwest _{0.9x}	0.77	x	3.6	64	X	9	7.38	x		0.44	×	0.8		172.94	(81)
Northwest 0.9x	0.77	x	3.6	64	X	,	91.1	х		0.44	x	0.8	=	161.78	(81)
Northwest 0.9x	0.77	x	3.6	64	X	7	2.63	x		0.44	x	0.8	=	128.97	(81)
Northwest 0.9x	0.77	x	3.6	64	X	5	0.42	x		0.44	×	0.8	=	89.54	(81)
Northwest _{0.9x}	0.77	x	3.6	64	X	2	8.07	x		0.44	x	0.8		49.84	(81)
Northwest 0.9x	0.77	x	3.6	64	X		14.2	x		0.44	x	0.8	=	25.21	(81)
Northwest 0.9x	0.77	x	3.6	64	X	,	9.21	x		0.44	x	0.8		16.36	(81)
_								•							
Solar gains in v	watts, ca	alculated	for eac	n mont	h			(83)m	n = Si	um(74)m .	(82)m		_	_	
(83)m= 68.68	123.65	186.86	261.16	319.57		29.15	312.39	266	5.99	212.3	141.42	83.48	57.99		(83)
Total gains – ir	nternal a	nd solai	· (84)m =	<u> </u>		83)m	, watts					_		_	
(84)m= 421.39	474.62	527.5	585.23	627.04	6	20.43	593.01	552	2.62	506.31	452.18	413.48	402.21		(84)
7. Mean interr	nal temp	erature	(heating	seaso	n)										
Temperature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisation fact	tor for g	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)							_	
Jan	Feb	Mar	Apr	May	_	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	_	
(86)m= 0.94	0.92	0.88	0.8	0.69		0.54	0.41	0.4	46	0.65	0.84	0.92	0.95	_	(86)
Mean_internal	tempera	ature in	living are	ea_T1 (follo	w ste	ps 3 to 7	7 in T	[able	e 9c)				_	
(87)m= 18.94	19.2	19.61	20.14	20.57	2	20.84	20.94	20.	.93	20.73	20.18	19.48	18.89		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 19.99 19.99 19.99 20.01 20.01 20.02 20.02 20.02 20.01 20.01 20 20		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.93 0.91 0.87 0.78 0.64 0.47 0.33 0.37 0.59 0.81 0.91 0.94		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 17.25 17.62 18.22 18.96 19.53 19.88 19.98 19.97 19.75 19.03 18.04 17.19		(90)
fLA = Living area ÷ (4) =	0.52	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_
(92)m= 18.13 18.44 18.94 19.57 20.07 20.38 20.48 20.47 20.25 19.62 18.78 18.07		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 18.13 18.44 18.94 19.57 20.07 20.38 20.48 20.47 20.25 19.62 18.78 18.07		(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	ulate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.92 0.89 0.84 0.76 0.65 0.5 0.37 0.41 0.61 0.79 0.89 0.92		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 385.97 422.24 445.48 447.12 405.7 309.86 220.3 226.99 307.49 358.73 366.59 371.41		(95)
Monthly average external temperature from Table 8		(2.5)
(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= 850.51 830.83 761.82 645.86 505.57 344.91 231.63 242.1 369.03 544.8 708.77 845.41		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		(01)
(98)m= 345.61 274.57 235.35 143.09 74.31 0 0 0 138.43 246.37 352.65		
Total per year (kWh/year) = Sum(98) _{15,912} =	1810.39	(98)
Space heating requirement in kWh/m²/year	32.74] (99)
9b. Energy requirements – Community heating scheme	-	J`
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 heat pump	1	(303a)
, ' ' ' <u> </u>		_
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	1810.39	<u> </u>
Space heat from Community heat pump $(98) \times (304a) \times (305) \times (306) =$	1900.91	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308

				-	٦
Space heating requirement from secon	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				1992.42	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	2092.04	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	39.93	(313)
Cooling System Energy Efficiency Ratio	0			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	· ,	side		107.27	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330	b) + (330g) =	107.27	(331)
Energy for lighting (calculated in Appen	dix L)			253.42	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-419.08	(333)
Electricity generated by wind turbine (A	ppendix M) (negative quantit	ty)		0	(334)
12b. CO2 Emissions - Community hea	ting scheme				
· · · · · · · · · · · · · · · · · · ·	_ ~				
	Ŭ	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		kWh/year	kg CO2/kWh	kg CO2/year	(367a)
·	vater heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%)	vater heating (not CHP) If there is CHP using two	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fuel	250 828.94	_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	vater heating (not CHP) If there is CHP using two [(307b)+(310b)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 =	250 828.94 20.72	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	vater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313) systems (363)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(372)	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 =	250 828.94 20.72 849.66	(367)
Efficiency 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 two [(307b)+(310t) [(313 systems (363) condary) (309)	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(372)	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 =	250 828.94 20.72 849.66	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	vater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous	kWh/year fuels repeat (363) to b)] x 100 ÷ (367b) x) x (366) + (368)(372)	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	250 828.94 20.72 849.66	(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 so CO2 associated with space heating (see	vater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373)	fuels repeat (363) to b)] x 100 ÷ (367b) x) x(366) + (368)(372 x heater (312) x + (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	250 828.94 20.72 849.66 0 849.66	(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 so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and water	vater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 systems (363) condary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling	fuels repeat (363) to b)] x 100 ÷ (367b) x) x(366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0 = 0.52 =	250 828.94 20.72 849.66 0 849.66 55.67	(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 so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and water CO2 associated with electricity for pum	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) scondary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332)	fuels repeat (363) to b)] x 100 ÷ (367b) x) x(366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0 = 0.52 =	250 828.94 20.72 849.66 0 849.66 55.67	(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 so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and w CO2 associated with electricity for pum CO2 associated with electricity for light Energy saving/generation technologies	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) scondary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332)	fuels repeat (363) to b)] x 100 ÷ (367b) x) x(366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 828.94 20.72 849.66 0 849.66 55.67 131.52	(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 so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and w CO2 associated with electricity for pum CO2 associated with electricity for light Energy saving/generation technologies Item 1	vater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 systems (363) scondary) (309) sion heater or instantaneous vater heating (373) ps and fans within dwelling ing (332) (333) to (334) as applicable	fuels repeat (363) to b)] x 100 ÷ (367b) x) x(366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	250 828.94 20.72 849.66 0 849.66 55.67 131.52	(372) (373) (374) (375) (376) (378) (379)

		l Jeer I	Details:						
Assessor Name:	Vitaliy Troyan	<u></u>	Strom	a Num	ber		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
		Property	Address	: 5_01 -	1B2P				
Address:	aniana.								
1. Overall dwelling dimer	isions:	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	146.55	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1	n)	55.3	(4)			_		
Dwelling volume				l (3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	146.55	(5)
2. Ventilation rate:									
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+ [0	 =	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	= +	0		0	x	20 =	0	(6b)
Number of intermittent fan	s				2	x ·	10 =	20	(7a)
Number of passive vents				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fire	es			Ė	0	X 4	40 =	0	(7c)
				_					_
				_			Air ch	nanges per ho	our —
•	s, flues and fans = $(6a)+(6b)+$ en carried out or is intended, proce			continue f	20		÷ (5) =	0.14	(8)
Number of storeys in the		5u to (11),	ourier wise t	Jonanae n	OIII (9) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresponding gs); if equal user 0.35	to the grea	ter wall are	a (atter					
·	oor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ente	·							0	(13)
Window infiltration	and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
•	y value, then $(18) = [(17) \div 20] +$							0.39	(18)
	if a pressurisation test has been do	ne or a de	egree air pe	rmeability	is being u	sed		_	7(10)
Number of sides sheltered Shelter factor	1		(20) = 1 -	[0.075 x (′	19)] =			3 0.78	(19) (20)
Infiltration rate incorporation	ng shelter factor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified fo	r monthly wind speed								
Jan Feb M	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 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								
(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	0.37	0.37	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.34	0.35]	
alculate effec		-	rate for t	he appli	cable ca	se	!				!	<u>, </u>	
If mechanical If exhaust air he			andiv N (2	3h) - (23a	a) v Emy (e	aguation (N	VSV) other	wice (23h) <i>- (</i> 23a)			0	
If balanced with) = (23a)			0	
		•	-	_					7h.\ //	00h) [/	1 (00.0)	0	
a) If balance	o mecha	o o	0	o with he	0		1K) (248	0	0	230) x [0) - 100]]	
b) If balance												J	
4b)m= 0	o mech	o 0	0	without 0	0	0	0	0	0	0	0	1	
c) If whole h									U			J	
if (22b)n				•	•				5 x (23b))			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	n from l	oft				J	
if (22b)n				•	•				0.5]				
4d)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 (24b	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	0.54	0.55	0.56	0.56]	
. Heat losse	e and he	at lose r	naramete	or:								_	
. Heat losse LEMENT	Gros	·	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-value	۵	ΑXk
LEIVIENI	area	_	m		A,r		W/m2		(W/I	〈)	kJ/m ² ·		kJ/K
indows Type	: 1				1.65	x1.	/[1/(1.4)+	0.04] =	2.19				
indows Type	2				2.12	x1,	/[1/(1.4)+	0.04] =	2.81	=			
indows Type	3				3.64	x1.	/[1/(1.4)+	0.04] =	4.83	=			
alls Type1	43.	5	12.7		30.8	x	0.18	─ <u>-</u>	5.54	=		— г	
alls Type2	12.2		0	=	12.2	=	0.18	=	2.2	=		- -	
oof	55.3		0	=		x				룩 ;		ᆿ 누	
otal area of e					55.3	= ^	0.13	[7.19				
or windows and			offective wi	ndow I I-ve	111	ated using	ı formula 1	/[/1/ ₋ valu	ne)+0 04] a	e aiven in	naragrani	h 3 2	
include the area						atou using	TOTTIUIA 1	I (170 vala	C)+0.0+j a	is giveri iii	paragrapi	7 5.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.7	77
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	497	7.7
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	0
r design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste						_							
nermal bridge	•	,			-	<						5.5	5
letails of therma Ital fabric he		are not kn	own (36) =	= <i>0.05 x (</i> 3	11)			(33) +	(36) =			07.0	32
entilation hea		alculator	l monthly	,					$= 0.33 \times ($	25\m v (5)		37.3	52
Jan	Feb	Mar			Jun	Jul	Διια	Sep	Oct	Nov		1	
3)m= 27.71	27.57	27.44	Apr 26.8	May 26.69	26.14	26.14	Aug 26.04	26.35	26.69	26.93	27.17	1	
		<u> </u>	20.0	20.00	20.14	20.14	20.04			<u> </u>	21.11	J	
eat transfer o		·			l				= (37) + (3			1	
9)m= 65.02	64.89	64.75	64.12	64	63.45	63.45	63.35	63.67	64	64.24	64.49	1	

Heat loss parar	meter (H	-II P) \///	m²K					(40)m	= (39)m ÷	. (4)			
(40)m= 1.18	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.17		
(10)=		11.17	11.10		1110	1.10			<u> </u>	Sum(40) ₁ .		1.16	(40)
Number of days	s in mo	nth (Tabl	le 1a)						.vo.ago	J		0	(-/
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	ng ene	rgy requi	rement:								kWh/ye	ear:	
												ı	
Assumed occup 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 (ΓFA -13.		85		(42)
Annual average Reduce the annual									se target o		.05		(43)
not more that 125 l	_				-	•	o acriieve	a water us	se larget o	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				<u></u>				СОР		1101			
(44)m= 85.85	82.73	79.61	76.49	73.36	70.24	70.24	73.36	76.49	79.61	82.73	85.85		
(**)										m(44) ₁₁₂ =	l	936.55	(44)
Energy content of I	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)Tm / 3600			· /			``
(45)m= 127.31	111.35	114.9	100.17	96.12	82.94	76.86	88.2	89.25	104.01	113.54	123.3		
								-	Total = Su	m(45) ₁₁₂ =	=	1227.97	(45)
If instantaneous wa	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m= 19.1	16.7	17.24	15.03	14.42	12.44	11.53	13.23	13.39	15.6	17.03	18.49		(46)
Water storage		مالد داد مال		-l \A	/\/! IDC	_4			1				
Storage volume	, ,					_		ame ves	sei		150		(47)
If community he Otherwise if no	•			•			` '	are) ante	or 'O' in <i>(</i>	47)			
Water storage I		not wate	:i (uii3 ii	iciuu c s i	iistaiitai	ieous co	ווטט וטוווי	ers) erite	ווו ט ווו (47)			
a) If manufactu		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	65		(48)
Temperature fa	ctor fro	m Table	2b							0.	54		(49)
Energy lost fror				ear			(48) x (49)) =			89		(50)
b) If manufactu		_	-		or is not	known:							,
Hot water stora	-			e 2 (kW	h/litre/da	ıy)					0		(51)
If community he	_		on 4.3										(==)
Volume factor factor factor factor factor			2h							—	0		(52) (53)
·							(47) ~ (54)) v (F2) v (l	E0)		0		, ,
Energy lost from Enter (50) or (5		_	, KVVII/y€	al			(47) X (31)) x (52) x (55) =	-	0 89		(54) (55)
Water storage I	, ,	,	or each	month			((56)m = (55) × (41)ı	m	0.	09		(00)
					00.77		., , ,	, , ,	ı	00.77	07.00		(EC)
(56)m= 27.66 If cylinder contains	24.99 dedicate	27.66 d solar sto	26.77 rage, (57)ı	27.66 m = (56)m	26.77 x [(50) – (27.66 H11)] ÷ (5	27.66 0), else (5	26.77 7)m = (56)	27.66 m where (26.77 H11) is fro	27.66 m Append	ix H	(56)
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
` ′		<u> </u>											(58)
Primary circuit	,	•			50)m - 1	'58\ · 26	S5 ~ (41)	m			0		(30)
(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 loss ca	lculated	for each	month (′61)m =	(60) ÷ 3	65 × (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(61)
	uired for	water he	eating ca	alculated	l for ead	h month	(62)m	= 0.85 ×	 (45)m +	(46)m +	(57)m +	- (59)m + (61)m	
(62)m= 178.24	157.35	165.83	149.46	147.05	132.23	127.79	139.1		154.94	162.82	174.22	1	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	H (nega	ive quantity	y) (entei	'0' if no sola	r contribu	tion to wate	er heating))	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applies	s, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter											
(64)m= 178.24	157.35	165.83	149.46	147.05	132.23	127.79	139.1	2 138.53	154.94	162.82	174.22]	_
							0	utput from w	ater heate	er (annual)	112	1827.58	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	<u>ı</u>]	
(65)m= 83.07	73.82	78.95	72.73	72.7	67.01	66.3	70.07	69.1	75.33	77.18	81.74]	(65)
include (57)	m in cald	culation o	of (65)m	only if c	ylinder	is in the	dwellir	g or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):									
Metabolic gair	ns (Table	5), Wat	ts								_	_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec]	
(66)m= 92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31	92.31]	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	ilso se	e Table 5					
(67)m= 14.35	12.75	10.37	7.85	5.87	4.95	5.35	6.96	9.34	11.85	13.83	14.75]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5			_	
(68)m= 160.96	162.63	158.42	149.46	138.15	127.52	120.42	118.7	5 122.95	131.92	143.23	153.86]	(68)
Cooking gains	(calcula	ted in A	opendix	L, equat	ion L15	or L15a), also	see Table	5	-	-		
(69)m= 32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23	32.23]	(69)
Pumps and fa	ns gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. ev	/aporatio	n (nega	ive valu	es) (Tab	le 5)								
(71)m= -73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.85	-73.8	5 -73.85	-73.85	-73.85	-73.85]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 111.66	109.85	106.11	101.02	97.72	93.06	89.11	94.18	95.98	101.24	107.19	109.86]	(72)
Total internal	gains =				(66	6)m + (67)m	า + (68)เ	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 340.66	338.92	328.59	312.02	295.42	279.23	268.57	273.5	7 281.96	298.7	317.95	332.16]	(73)
6. Solar gain	s:												
Solar gains are		•				·	ations to	convert to th	ne applica		tion.	_	
Orientation:	Access F Table 6d	actor	Area m²		Flo	ux ible 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
_												. ,	٦
Southwest _{0.9x}	0.77	X	1.6	==		36.79	┆╶┟	0.63		0.7	=	37.11	<u> </u> (79)
Southwesto s	0.77	X	2.1			36.79	<u> </u>	0.63		0.7	=	23.84	<u></u> (79)
Southwesto.9x	0.77	X	1.6			62.67	ļ <u>Ļ</u>	0.63	×	0.7	=	63.21	」 (79)
Southwest _{0.9x}	0.77	X	2.1		<u> </u>	62.67	ļĻ	0.63		0.7	=	40.61	」 (79)
Southwest _{0.9x}	0.77	X	1.6	35	X	85.75	J L	0.63	Х	0.7	=	86.48	(79)

Southwest _{0.9x}	0.77	x	0.44		X		.r. 7r	1		0.00	×	0.7		55.50	(79)
Southwest _{0.9x}	0.77	_	2.12				5.75]]		0.63	╡	0.7	=	55.56	
Southwest _{0.9x}	0.77	×	1.6		X		06.25]]		0.63	」 [×]	0.7	╡ :	107.16	(79)
Southwest _{0.9x}	0.77	×	2.12		X		06.25]]		0.63	」 × ¬ 、	0.7	┥:	68.84	
Southwest _{0.9x}	0.77	x	1.6		X		19.01]]		0.63	x	0.7	_ =	120.02	== `
Southwest _{0.9x}	0.77	x	2.12		Χ		19.01] 1		0.63	X	0.7	_ =	77.11	(79)
<u> </u>	0.77	X	1.6		X		18.15] 1		0.63	×	0.7	_ =	119.16	=
Southwesto.9x	0.77	X	2.12		X		18.15] 1		0.63	×	0.7	_ =	76.55	(79)
Southwesto.ex	0.77	X	1.6		X		13.91] i		0.63	×	0.7	_ =	114.88	=======================================
Southwest _{0.9x}	0.77	X	2.12		X		13.91] 1		0.63	X	0.7	=	73.8	(79)
Southwesto.9x	0.77	X	1.6		X		04.39	 		0.63	×	0.7	=	105.28	
Southwest _{0.9x}	0.77	X	2.12		X		04.39	 		0.63	×	0.7	_ =	67.63	(79)
Southwest _{0.9x}	0.77	×	1.6	5	X	5	2.85	 		0.63	×	0.7	=	93.64	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	9	2.85			0.63	×	0.7	=	60.16	(79)
Southwest _{0.9x}	0.77	Х	1.6	5	X	6	9.27			0.63	X	0.7	=	69.86	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	6	9.27	<u> </u>		0.63	X	0.7	=	44.88	(79)
Southwest _{0.9x}	0.77	X	1.6	5	X	4	4.07			0.63	X	0.7	=	44.45	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	4	4.07	[0.63	X	0.7	=	28.55	(79)
Southwest _{0.9x}	0.77	X	1.6	5	X	3	1.49			0.63	X	0.7	=	31.76	(79)
Southwest _{0.9x}	0.77	X	2.12	2	X	3	1.49			0.63	X	0.7	=	20.4	(79)
Northwest _{0.9x}	0.77	X	3.6	4	X	1	1.28	X		0.63	X	0.7	=	25.1	(81)
Northwest _{0.9x}	0.77	X	3.6	4	X	2	2.97	X		0.63	X	0.7	=	51.1	(81)
Northwest _{0.9x}	0.77	X	3.6	4	X	4	1.38	X		0.63	X	0.7	=	92.06	(81)
Northwest _{0.9x}	0.77	X	3.64	4	X	6	7.96	X		0.63	X	0.7	=	151.19	(81)
Northwest _{0.9x}	0.77	X	3.6	4	X	9	1.35	X		0.63	X	0.7	=	203.23	(81)
Northwest _{0.9x}	0.77	X	3.64	4	x	9	7.38	x		0.63	X	0.7	=	216.67	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	,	91.1	x		0.63	X	0.7	=	202.69	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	7	2.63	x		0.63	X	0.7	=	161.58	(81)
Northwest _{0.9x}	0.77	X	3.6	4	x	5	0.42	x		0.63	x	0.7	=	112.18	(81)
Northwest _{0.9x}	0.77	X	3.64	4	x	2	8.07	X		0.63	x	0.7	=	62.45	(81)
Northwest 0.9x	0.77	х	3.64	4	x		14.2	X		0.63	x	0.7	=	31.59	(81)
Northwest _{0.9x}	0.77	X	3.64	4	x	,	9.21	x		0.63	x	0.7	=	20.5	(81)
								-							
Solar gains in v	vatts, ca	lculated	for each	mont	h_			(83)m	n = Su	ım(74)m	(82)m			_	
(83)m= 86.05	154.91	234.1	327.19	400.36		12.37	391.37	334	4.5	265.98	177.18	104.59	72.66		(83)
Total gains – in	ternal a	nd solar	(84)m =	(73)m	+ (83)m	, watts						1	7	
(84)m= 426.71	493.83	562.69	639.21	695.79) 6	91.6	659.94	608	.07	547.94	475.89	422.53	404.82	_	(84)
7. Mean intern	nal temp	erature	(heating	seaso	n)										
Temperature of	during h	eating p	eriods in	the liv	/ing	area	from Tal	ole 9	, Th1	I (°C)				21	(85)
Utilisation fact	or for ga	ains for I	iving are	a, h1,ı	n (s	ee Ta	ble 9a)							_	
Jan	Feb	Mar	Apr	May	<u>/ </u>	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	_	
(86)m= 0.99	0.99	0.97	0.9	0.76		0.57	0.42	0.4	47	0.73	0.94	0.99	1	_	(86)
Mean_internal	tempera	ature in	living are	a T1 (follo	w ste	ps 3 to 7	in T	able	9c)				_	
(87)m= 19.88	20.06	20.33	20.66	20.89	2	20.98	21	20.	99	20.93	20.63	20.19	19.85		(87)
														_	

T			and a dia dia			(T.	LL O T	LO (0 0)					
Temperatu		, , ,				1	1	``	10.05	40.05	10.05		(00)
(88)m= 19.9 ²	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.96	19.95	19.95	19.95		(88)
Utilisation f		1			```		9a)						
(89)m= 0.99	0.98	0.96	0.87	0.7	0.48	0.32	0.37	0.65	0.91	0.98	0.99		(89)
Mean interr	nal tempe	rature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)		_		
(90)m= 18.47	7 18.73	19.12	19.58	19.86	19.95	19.96	19.96	19.91	19.55	18.93	18.43		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.52	(91)
Mean interr	nal tempe	rature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2			·		
(92)m= 19.2		19.75	20.14	20.39	20.48	20.5	20.5	20.44	20.11	19.59	19.16		(92)
Apply adjus	tment to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.2	19.42	19.75	20.14	20.39	20.48	20.5	20.5	20.44	20.11	19.59	19.16		(93)
8. Space he	eating req	uirement											
Set Ti to the the utilisation			•		ned at sto	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jar	1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation f	actor for g	jains, hm	<u>. </u>										
(94)m= 0.99	0.98	0.95	0.88	0.73	0.53	0.37	0.42	0.69	0.92	0.98	0.99		(94)
Useful gain	s, hmGm	, W = (94	4)m x (84	4)m									
(95)m= 422.5	1 483.98	536.61	561.81	507.01	365.48	246.26	257.51	376.5	436.55	414.16	401.67		(95)
Monthly av	erage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra		1				- ` 	x [(93)m	– (96)m]				
(97)m= 968.9		857.86	720.79	556.34	373.39	247.37	259.56	403.77	608.54	802.17	965.04		(97)
Space heat		1			i					·			
(98)m= 406.5	8 307.75	239.02	114.46	36.7	0	0	0	0	127.96	279.36	419.15		_
							Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1930.98	(98)
Space heat	ing requir	ement in	kWh/m²	/year								34.92	(99)
9a. Energy r	equireme	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space hea	•			/I							i	_	¬,,,,,
Fraction of	•				mentary	-		,				0	(201)
Fraction of	space hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of	total heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of	f main sp	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	f seconda	ary/supple	ementar	y heating	g systen	ո, %						0	(208)
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space heat	ing requir	ement (c	alculate	d above))							•	
406.5	8 307.75	239.02	114.46	36.7	0	0	0	0	127.96	279.36	419.15		
(211)m = {[(9	98)m x (20	04)] } x 1	00 ÷ (20)6)									(211)
434.8	4 329.15	255.63	122.42	39.26	0	0	0	0	136.85	298.78	448.29		
	•	•			•	•	Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	<u></u>	2065.22	(211)
Space heat	ing fuel (s	econdar	y), kWh/	month									_
= {[(98)m x (•		• , .										
(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)

Vater heating Output from water heater (calculated above)								
·	32.23 127.79	139.12	138.53	154.94	162.82	174.22		
Efficiency of water heater	•						79.8	(21
217)m= 86.95 86.57 85.79 84.11 81.73	79.8 79.8	79.8	79.8	84.31	86.24	87.07		(21
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m								
, <u> </u>	165.7 160.13	174.34	173.6	183.78	188.8	200.09		
	•	Tota	I = Sum(2	19a) ₁₁₂ =		•	2184.1	(21
Annual totals				k\	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							2065.22	
Vater heating fuel used							2184.1	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(23
boiler with a fan-assisted flue						45		(23
otal electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(23
Electricity for lighting							253.42	(23
12a. CO2 emissions – Individual heating system	s including m	icro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	446.09	(26
Space heating (secondary)	(215) x			0.5	19	=	0	(26
Vater heating	(219) x			0.2	16	=	471.76	(26
Space and water heating	(261) + (262)	+ (263) + (264) =				917.85	(26
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(26
electricity for lighting	(232) x			0.5	19	=	131.52	(26

TER =

(273)

28.81

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:44

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64.7m²

Plot Reference: Site Reference: **Tottenham Mews** 5_02 - 2B3P

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

29.93 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 15.25 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 56.9 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.20 (max. 0.30) 0.20 (max. 0.70) OK Floor (no floor) Roof 0.14 (max. 0.20) 0.14 (max. 0.35) OK

Openings 1.10 (max. 2.00) 1.10 (max. 3.30)

OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Space heating controls Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls: Cylinderstat OK

OK

Regulations Compliance Report

7 Low energy lights		
	400.00/	
Percentage of fixed lights with low-energy fittings	100.0%	01/
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	ОК
MVHR efficiency:	78%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	6.82m²	
Windows facing: North East	9.51m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or rolle	er blind
	Closed 100% of daylight hou	irs
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	

Community heating, heat from electric heat pump

Photovoltaic array

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.5.12	
	F	Property	Address	5_02 -	2B3P				
Address: 1. Overall dwelling dime	ncione:								
1. Overall dwelling diffle	11310113.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	')
Ground floor				(1a) x		.65	(2a) =	171.45	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	64.7	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	171.45	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys		7 + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	╗┾╒	0	Ī - Ē	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x '	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced			continuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		o 10 (11),	ourier wise t	onunae n	om (5) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are prideducting areas of opening	resent, use the value corresponding t ngs); if equal user 0.35	o the grea	ter wall are	a (atter					
•	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	•							0	(13)
<u> </u>	s and doors draught stripped		0.05 [0.0	v (1.4) · .4	1001			0	(14)
Window infiltration			0.25 - [0.2] (8) + (10)	. ,	-	⊥ (15) –		0	(15)
Infiltration rate	q50, expressed in cubic metr	se par h					area	0	(16)
•	ity value, then (18) = [(17) ÷ 20]+		•	•	elle oi e	rivelope	aica	0.15	(17)
•	s if a pressurisation test has been do				is being u	sed		0.10	()
Number of sides sheltere	d							3	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified for		1	1 .		T _	T	I _	1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		T	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 = $(22a)$ m =	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		

djusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
<i>alculate effed</i> If mechanica		_	rate for t	he appli	cable ca	se	•			•	•	0.5	(2
If exhaust air h	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				66.3	(2
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (I	MV) (24b	o)m = (22	2b)m + (23b)			
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h			ntilation on then (24)		•				5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n			ole hous m = (22b		•				0.5]			•	
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		-	-	-	
5)m= 0.32	0.31	0.31	0.3	0.29	0.28	0.28	0.28	0.28	0.29	0.3	0.31		(2
B. Heat losse	s and he	eat loss i	paramet	ër.									
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-		A X k kJ/K
indows Type) 1				6.82	x1	/[1/(1.1)+	0.04] =	7.19				(2
indows Type	2				3.17	x1	/[1/(1.1)+	0.04] =	3.34				(2
alls Type1	57.	5	16.33	3	41.17	x	0.2	=	8.23				(2
alls Type2	14.8	8	0		14.8	X	0.19	= [2.74				(2
oof	64.7	7	0		64.7	X	0.14	= [9.06				(;
otal area of e	lements	, m²			137								(;
or windows and include the area						ated using	g formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragraph	1 3.2	
abric heat los	ss, W/K =	= S (A x	U)				(26)(30)) + (32) =				37.24	(;
eat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	582.3	(:
nermal mass	parame	ter (TMF	o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
er design assess n be used inste				construct	ion are no	known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
nermal bridge				usina An	nendix k	<						20.55	(;
letails of therma	`	,		• .	•	•						20.55	(
otal fabric he	at loss							(33) +	(36) =			57.79	(;
entilation hea	at loss ca	alculated	l monthly	<u>/</u>				(38)m	= 0.33 × ((25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 17.92	17.76	17.59	16.77	16.6	15.78	15.78	15.62	16.11	16.6	16.93	17.26		(3
	nofficial	nt W/K						(39)m	= (37) + (37)	 38)m			
eat transfer o	,oemolei	,,						()	(- / (
eat transfer (9)m= 75.71	75.54	75.38	74.56	74.39	73.57	73.57	73.41	73.9	74.39	74.72	75.05		

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 1.17	1.17	1.17	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16		
	!	!	Į.	ļ.	Į.	!	<u> </u>		Average =	Sum(40) ₁	12 /12=	1.15	(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 requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		11		(42)
Annual averag	je hot wa al average	hot water	usage by	5% if the a	lwelling is	designed i			se target o		.33		(43)
not more that 125	litres per	person pei	<i>day (all</i> w	/ater use, l	not and co	ld) •			,				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 92.77	89.39	86.02	82.65	79.27	75.9	75.9	79.27	82.65	86.02	89.39	92.77		_
Energy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,ı	n x nm x D	OTm / 3600			ım(44) ₁₁₂ = ables 1b, 1		1012.02	(44)
(45)m= 137.57	120.32	124.16	108.25	103.87	89.63	83.05	95.31	96.44	112.4	122.69	133.23		
, ,	l			l		l			Total = Su	I ım(45) ₁₁₂ =	=	1326.91	(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)			'		
(46)m= 20.64	18.05	18.62	16.24	15.58	13.44	12.46	14.3	14.47	16.86	18.4	19.98		(46)
Water storage			-										
Storage volum	,					•		ame ves	sel		200		(47)
If community h Otherwise if no	_			-			, ,	ore) onto	or 'O' in <i>(</i>	(17)			
Water storage		not wate	i (uno n	iciuues i	Hotalital	ieous cc	ווטט וטוווו	ers) erite	51 U III ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWl	n/day):				2.	24		(48)
Temperature f					`	• ,					.6		(49)
Energy lost fro				ear			(48) x (49)) =			34		(50)
b) If manufact		•			or is not	known:							, ,
Hot water stor	•			le 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	_		on 4.3										(==)
Temperature f			2h								0		(52) (53)
·							(47) × (54)) v (EQ) v ((F2)		0		, ,
Energy lost fro Enter (50) or		_	, KVVII/y	ear			(47) X (31)) x (52) x (55) =		0 34		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = ((55) × (41)	m	1.	.34		(55)
							. , ,	·		T			(50)
(56)m= 41.66 If cylinder contains	37.63	41.66	40.32	41.66 m = (56)m	40.32	41.66	41.66	40.32	41.66	40.32	41.66	iv Li	(56)
										1		XII	
(57)m= 41.66	37.63	41.66	40.32	41.66	40.32	41.66	41.66	40.32	41.66	40.32	41.66		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•		, ,						
(modified by			ı —		ı —			<u> </u>	1	- 			(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 × (41)m													
(61)m= 0	0	0	0	0	00) + 3	03 × (41)	0	T 0	0	T 0	0	1	(61)
												J (59)m + (61)m	(-)
(62)m= 202.5	178.97	189.09	171.08	168.79	152.46	147.98	160.2		177.32	185.52	198.16	(39)111 + (01)111	(62)
Solar DHW input						1			ļ			I	(/
(add additiona										tion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from w	ı ıater hea	ter				ļ	l .			<u> </u>		J	
(64)m= 202.5	178.97	189.09	171.08	168.79	152.46	147.98	160.2	3 159.28	177.32	185.52	198.16]	
` '	Į.					l	C	utput from w	ater heate	er (annual)	l12	2091.37	(64)
Heat gains fro	m water	heating.	kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61)ml + 0.8	x [(46)m	+ (57)m	+ (59)m	1	
(65)m= 97.68	86.92	93.22	86.26	86.48	80.07	79.56	83.6		89.31	91.06	96.24	اُ	(65)
include (57)	m in cal	culation o	of (65)m	only if c	vlinder	is in the	dwellir	na or hot w	ater is f	rom com	munity h	ı neating	
5. Internal g								3			• •	Jan 9	
Metabolic gair	,												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 105.55	105.55	105.55	105.55	105.55	105.55	105.55	105.5	5 105.55	105.55	105.55	105.55		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equati	on L9 c	r L9a), a	lso se	e Table 5				•	
(67)m= 16.46	14.62	11.89	9	6.73	5.68	6.14	7.98	10.71	13.6	15.87	16.92]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	За), а	lso see Ta	ble 5				
(68)m= 184.63	186.54	181.71	171.44	158.46	146.27	138.12	136.2	1 141.03	151.31	164.29	176.48]	(68)
Cooking gains	calcula (ted in A	ppendix	L, equat	ion L15	or L15a	, also	see Table	5	•		•	
(69)m= 33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.5	33.55	33.55	33.55	33.55		(69)
Pumps and fa	ns gains	(Table 5	Ба)			•	•	•	•	•	•	•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)	•		•	•	•	•	•	
(71)m= -84.44	-84.44	-84.44	-84.44	-84.44	-84.44	-84.44	-84.4	4 -84.44	-84.44	-84.44	-84.44		(71)
Water heating	gains (T	able 5)				•	•	•	•	•	•	•	
(72)m= 131.3	129.35	125.3	119.8	116.23	111.2	106.93	112.4	1 114.35	120.04	126.47	129.36		(72)
Total interna	gains =				(66)m + (67)m	ı + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 387.05	385.17	373.57	354.9	336.09	317.82	305.85	311.2	5 320.76	339.62	361.29	377.42		(73)
6. Solar gain	s:							,	,	,			
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to	convert to the	ne applica	ble orienta	tion.		
Orientation:		actor	Area		Flu			g_ a	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast _{0.9x}	0.77	X	6.8	32	X	11.28	x	0.44	X	0.8	=	18.77	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	11.28	x	0.44	×	0.8	=	26.17	(75)
Northeast _{0.9x}	0.77	X	6.8	32	X	22.97	x	0.44	×	0.8	=	38.21	(75)
Northeast _{0.9x}	0.77	х	3.1	7	X :	22.97	x	0.44	x	0.8	=	53.28	(75)
Northeast _{0.9x}	0.77	X	6.8	32	х .	41.38	X	0.44	x	0.8	=	68.84	(75)

ът и г Г							1		_		_		_
Northeast _{0.9x}	0.77	X	3.1	7	x	41.38	X	0.44	×	0.8	=	95.99	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	67.96	X	0.44	X	0.8	=	113.05	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	67.96	X	0.44	X	0.8	=	157.65	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	91.35	X	0.44	X	0.8	=	151.97	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	91.35	X	0.44	X	0.8	=	211.91	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	97.38	X	0.44	X	0.8	=	162.01	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	97.38	X	0.44	X	0.8	=	225.92	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	91.1	X	0.44	X	0.8	=	151.56	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	91.1	X	0.44	X	0.8	=	211.34	(75)
Northeast 0.9x	0.77	X	6.8	32	x	72.63	X	0.44	X	0.8	=	120.83	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	72.63	X	0.44	X	0.8	=	168.48	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	50.42	X	0.44	X	0.8	=	83.88	(75)
Northeast _{0.9x}	0.77	X	3.1	17	x	50.42	X	0.44	X	0.8	=	116.97	(75)
Northeast _{0.9x}	0.77	Х	6.8	32	x	28.07	X	0.44	X	0.8	=	46.69	(75)
Northeast _{0.9x}	0.77	х	3.1	7	x	28.07	X	0.44	x	0.8	=	65.11	(75)
Northeast _{0.9x}	0.77	X	6.8	32	x	14.2	x	0.44	x	0.8	=	23.62	(75)
Northeast _{0.9x}	0.77	х	3.1	7	x	14.2	x	0.44	x	0.8		32.93	(75)
Northeast _{0.9x}	0.77	x	6.8	32	x	9.21	X	0.44	x	0.8	_	15.33	(75)
Northeast _{0.9x}	0.77	x	3.1	7	x	9.21	x	0.44	x	0.8		21.38	(75)
·							_						
Solar gains in	watts, cald	culated	for eacl	h month	l		(83)m	n = Sum(74)m .	(82)m				
			070.7	363.87	007		T					1	
(83)m= 44.95	91.49	164.83	270.7	303.67	387.	93 362.9	289	.31 200.85	111.8	56.55	36.7]	(83)
(83)m= 44.95 Total gains – i							289	.31 200.85	111.8	56.55	36.7		(83)
` '	nternal and					m , watts	600		451.42	<u> </u>	414.12]	(83)
Total gains – i	nternal and	d solar 538.4	(84)m = 625.6	= (73)m 699.96	+ (83) 705.	m , watts		I			1		, ,
Total gains – i (84)m= 431.99	nternal and 476.66	d solar 538.4 rature ((84)m = 625.6 heating	= (73)m 699.96 season	+ (83) 705.	m , watts 75 668.75	600	.56 521.61			1	21	, ,
Total gains – i (84)m= 431.99 7. Mean inter	and temper during hear	d solar 538.4 rature (ating pe	(84)m = 625.6 heating eriods in	= (73)m 699.96 season the livi	+ (83) 705.	m, watts 75 668.75 ea from Tal	600	.56 521.61			1	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature	and temper during hear	d solar 538.4 rature (ating pe	(84)m = 625.6 heating eriods in	= (73)m 699.96 season the livi	+ (83) 705.	m , watts 75 668.75 ea from Tal Table 9a)	600 ble 9	.56 521.61		2 417.84	1	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac	nternal and 476.66 Area tempe during heater for gain	d solar 538.4 rature (ating pe	(84)m = 625.6 heating eriods in ving are	= (73)m 699.96 season the livi	705.	ea from Tal Table 9a)	600 ble 9	.56 521.61 , Th1 (°C)	451.42	2 417.84	414.12	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac	tor for gail Feb 0.94	rature (ating pens for limes for lim	(84)m = 625.6 heating eriods in ving are Apr 0.84	= (73)m 699.96 season the livi ea, h1,m May 0.72	+ (83) 705. ng are (see Ju	ea from Tal Table 9a) n Jul	600 ble 9	.56 521.61 , Th1 (°C) ug Sep 5 0.72	451.42 Oct	2 417.84 Nov	414.12 Dec	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96	nternal and 476.66 and tempe during heator for gain Feb 0.94 at temperate	rature (ating pens for limes for lim	(84)m = 625.6 heating eriods in ving are Apr 0.84	= (73)m 699.96 season the livi ea, h1,m May 0.72	+ (83) 705. ng are (see Ju	ea from Tal Table 9a) n Jul 7 0.44	600 ble 9	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c)	451.42 Oct	2 417.84 Nov 0.94	414.12 Dec	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67	nternal and 476.66 and temperaturing heater for gain Feb 0.94 at temperature 18.9	rature (ating pens for li Mar 0.91 cure in li 19.35	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (fo	+ (83) 705. ng are (see	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7	600 ble 9 A 0 7 in T	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62	451.42 Oct 0.88	2 417.84 Nov 0.94	Dec 0.96	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96 Mean interna	nternal and 476.66 rnal tempe during head to for gain Feb 0.94 rtemperate 18.9 during head during head temperate 18.9 during head temperate 18.0 during head	rature (ating pens for li Mar 0.91 cure in li 19.35	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (fo	+ (83) 705. ng are (see	ea from Tall Table 9a) n Jul 7 0.44 steps 3 to 1 1 20.93	600 ble 9 A 0 7 in T	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C)	451.42 Oct 0.88	Nov 0.94	Dec 0.96	21	(84)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96 Mean internation (87)m= 18.67 Temperature (88)m= 19.94	rnal tempe during head ctor for gain Feb 0.94 Il temperate 18.9 during head	rature (ating persons for limited in limite	heating eriods in Apr 0.84 iving are 19.96 eriods in 19.96	ea T1 (for 20.48)	+ (83) 705. ng are (see Ju 0.5 ollow 20.8 dwell 19.9	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 1 20.93 ing from Tal	600 ble 9 A 0. 7 in T 20 able 9	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C)	Oct 0.88	Nov 0.94	Dec 0.96	21	(84) (85) (86) (87)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac	nternal and 476.66 and temperaturing heat temperature 18.9 during heat 19.95 are tor for gain temperaturing heat 19.95 are tor for gain temperaturing heat 19.95 are tor for gain temperaturing heat 19.95 are tor for gain	rature (ating pens for li Mar 0.91 cure in li 19.35 ating pens for re	heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of details.	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 n rest of 19.96 welling,	+ (83) 705. ng are 1 (see 0.5 ollow 20.8 dwell 19.9 h2,m	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta	600 ble 9 A 0 7 in T 20 able 9 19	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97	Oct 0.88	Nov 0.94 19.22	Dec 0.96 18.63	21	(84) (85) (86) (87) (88)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95	nternal and 476.66 and tempe during here tor for gain Feb 0.94 at temperat 18.9 at temperat 19.95 at t	rature (ating pens for li Mar 0.91 cure in li 19.35 ating pens for re 0.9	heating eriods ir ving are 19.96 eriods ir 19.96 est of do 0.81	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 or rest of 19.96 welling, 0.67	+ (83) 705. ng are 1 (see 0.5 ollow 20.8 dwell 19.9 h2,m 0.5	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta 7 19.97 (see Table 0.35	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97	Oct 0.88 19.96 0.86	Nov 0.94	Dec 0.96	21	(84) (85) (86) (87)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac [86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95 Mean interna	nternal and 476.66 and tempe during heat temperate 18.9 and 19.95 are tor for gain 19.95 are tor for gain 19.95 are tor for gain 19.94 and temperate 18.9 are tor for gain 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.95 are	rature (ating persons for limited in limite	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest	ea T1 (for 20.48 m) rest of 19.96 welling, 0.67 of dwelling	+ (83) 705. ng are (see Ju 0.5 ollow 20.8 dwell 19.9 h2,m 0.5 ing T2	m , watts 75 668.75 ea from Tal Table 9a) n	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 , Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 11 0.65 1 to 7 in Table	Oct 0.88 19.96 0.86 e 9c)	Nov 0.94 19.22 19.96	Dec 0.96 18.63 19.95	21	(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95	nternal and 476.66 and tempe during heat temperate 18.9 and 19.95 are tor for gain 19.95 are tor for gain 19.95 are tor for gain 19.94 and temperate 18.9 are tor for gain 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.95 are	rature (ating pens for li Mar 0.91 cure in li 19.35 ating pens for re 0.9	heating eriods ir ving are 19.96 eriods ir 19.96 est of do 0.81	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 or rest of 19.96 welling, 0.67	+ (83) 705. ng are 1 (see 0.5 ollow 20.8 dwell 19.9 h2,m 0.5	m , watts 75 668.75 ea from Tal Table 9a) n	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 41 0.65 4 to 7 in Table .9 19.59	Oct 0.88 19.96 0.86 e 9c) 18.71	Nov 0.94 19.22 19.96 0.93	Dec 0.96 18.63 19.95 0.96		(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac [86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95 Mean interna	nternal and 476.66 and tempe during heat temperate 18.9 and 19.95 are tor for gain 19.95 are tor for gain 19.95 are tor for gain 19.94 and temperate 18.9 are tor for gain 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.94 are temperate 19.95 are tor for gain 19.94 are temperate 19.95 are	rature (ating persons for limited in limite	(84)m = 625.6 heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest	ea T1 (for 20.48 m) rest of 19.96 welling, 0.67 of dwelling	+ (83) 705. ng are (see Ju 0.5 ollow 20.8 dwell 19.9 h2,m 0.5 ing T2	m , watts 75 668.75 ea from Tal Table 9a) n	600 ble 9 A 0.7 in T 20 able 9 19. 9a) 0.4	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 41 0.65 4 to 7 in Table .9 19.59	Oct 0.88 19.96 0.86 e 9c) 18.71	Nov 0.94 19.22 19.96	Dec 0.96 18.63 19.95 0.96	21	(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fact [86)m= 0.96 Mean internation (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fact (89)m= 0.95 Mean internation (90)m= 16.84	nternal and 476.66 mal tempe during heat temperate 18.9 during heat 19.95 etor for gain 19.95 etor for gain 17.17	rature (ating pens for li Mar 0.91 ture in li 19.35 ating pens for re 0.9 ture in ti 17.82	heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest 18.68	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 n rest of 19.96 welling, 0.67 of dwell	+ (83) 705. ng are (see Ju 0.5 collow 20.8 dwell 19.9 h2,m 0.5 ing T2	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta 7 19.97 (see Table 0.35 2 (follow ste	600 ble 9 A 0.4 7 in T 20 able 9 19. 9a) 0.4 eps 3	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 41 0.65 4 to 7 in Table .9 19.59	Oct 0.88 19.96 0.86 e 9c) 18.71	Nov 0.94 19.22 19.96 0.93 17.65 ring area ÷ (4	Dec 0.96 18.63 19.95 0.96		(84) (85) (86) (87) (88) (89) (90) (91)
Total gains – i (84)m= 431.99 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.96 Mean interna (87)m= 18.67 Temperature (88)m= 19.94 Utilisation fac (89)m= 0.95 Mean interna (90)m= 16.84	nternal and 476.66 nal tempe during heater for gain 18.9 during heater 19.95 etor for gain 19.95 etor for gain 17.17 lt temperat 18.13	rature (ating pens for li Mar 0.91 ture in li 19.35 ating pens for re 0.9 ture in tens for re 17.82 ture (for	heating eriods ir ving are Apr 0.84 iving are 19.96 eriods ir 19.96 est of do 0.81 he rest 18.68	e (73)m 699.96 season the livi ea, h1,m May 0.72 ea T1 (for 20.48 n rest of 19.96 welling, 0.67 of dwell 19.38	+ (83) 705. ng are (see Ju 0.5 collow 20.8 dwell 19.9 h2,m 0.5 ing T2 19.6	ea from Tal Table 9a) n Jul 7 0.44 steps 3 to 7 1 20.93 ing from Ta 7 19.97 (see Table 0.35 2 (follow ste 3 19.92 = fLA × T1 6 20.48	600 ble 9 A 0.4 7 in T 20 able 9 19. 9a) 0.4 eps 3 19 + (1 20.	.56 521.61 y, Th1 (°C) ug Sep 5 0.72 Table 9c) .9 20.62 9, Th2 (°C) 97 19.97 11 0.65 1 to 7 in Table .9 19.59 - fLA) × T2 46 20.17	Oct 0.88 19.96 19.96 0.86 e 9c) 18.71 19.41	Nov 0.94 19.22 19.96 0.93 17.65 ving area ÷ (4)	Dec 0.96 18.63 19.95 0.96		(84) (85) (86) (87) (88) (89)

												ı	
(93)m= 17.86	18.13	18.67	19.4	20	20.36	20.48	20.46	20.17	19.41	18.53	17.81		(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		· ·	1	<u> </u>		1 3						
(94)m= 0.94	0.92	0.88	0.8	0.68	0.53	0.4	0.45	0.67	0.84	0.91	0.94		(94)
Useful gains,	hmGm	, W = (94	4)m x (8	4)m	•								
(95)m= 403.97	437.15	472.75	499.23	473.25	371.15	267.31	272.1	347.97	379.63	381.91	389.55		(95)
Monthly aver	age exte	rnal tem		from Ta	able 8	·	1					ı	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate		i	 		i	-``	- ` 	<u> </u>				1	(07)
(97)m= 1026.54		917.35	782.5	617.1	423.68	285.63	297.81	448.31	655.21	853.85	1021.59		(97)
Space heatin (98)m= 463.19	g require 378.04	330.79	r each n 203.95	107.02	/Vh/mon	$\ln = 0.02$	24 x [(97])m – (95 0)m] x (4 205.03	1)m 339.79	470.24		
(98)m= 463.19	370.04	330.79	203.93	107.02		0					<u> </u>	2400.06	(98)
							Tota	l per year	(kvvn/year) = Sum(9	8)15,912 =	2498.06	╡``
Space heatin	g require	ement in	kWh/m²	² /year								38.61	(99)
9b. Energy red	quiremer	nts – Cor	mmunity	heating	scheme								
This part is us Fraction of spa										unity sch	neme.	0	(301)
·			•		-	_	(Table T	1) 0 11 11	OHE			0	╡`
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; ti	he latter	
includes boilers, here		-			rom power	stations.	see Appei	iuix C.				1	(303a)
Fraction of total					eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for conf	rol and	charging	method	(Table	4c(3)) fo	r commı	unity hea	iting sys	tem			1	(305)
Distribution los				,			•	0,				1.05	(306)
Space heating		`	,		,	5 ,						kWh/yea	
Annual space	_	requiren	nent									2498.06	<u></u>
Space heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	2622.96	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	3												_
Annual water		equirem	ent									2091.37	
If DHW from c Water heat fro				0				(64) x (30	03a) x (30	5) x (306) :	=	2195.94	(310a)
Electricity used		-					0.01	× [(307a).	(307e) +	(310a)([310e)] =	48.19	(313)
Cooling System	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans v	within dv	velling (Γable 4f)	:							_
mechanical ve							outside					125.51	(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) =	125.51	(331)
Energy for lighting (calculated in Appendix L)			290.68	(332)
Electricity generated by PVs (Appendix M) (negative quantity))		-490.72	(333)
Electricity generated by wind turbine (Appendix M) (negative	quantity)		0	(334)
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 CHF Efficiency of heat source 1 (%) If there is CHP us	P) sing two fuels repeat (363) to	(366) for the second fue	el 250	(367a)
CO2 associated with heat source 1 [(307b)	o)+(310b)] x 100 ÷ (367b) x	0.52	1000.4	(367)
Electrical energy for heat distribution	[(313) x	0.52	25.01	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2) =	1025.41	(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	0.52	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		1025.41	(376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x	0.52	65.14	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	150.86	(379)
Energy saving/generation technologies (333) to (334) as appl Item 1	icable	0.52 x 0.01 =	-254.68	(380)
Total CO2, kg/year sum of (376)(382) =			986.73	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			15.25	(384)
El rating (section 14)			87.95	(385)

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	<u> </u>	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.5.12	
	F	Property	Address	: 5_02 -	2B3P				
Address: 1. Overall dwelling dime	pnoiono:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Ground floor				(1a) x		2.65	(2a) =	171.45	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	64.7	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	171.45	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	╗┾╒	0	Ī = Ī	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				2	x ²	10 =	20	(7a)
Number of passive vents	3			Ī	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_					
				_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continue fr	20		÷ (5) =	0.12	(8)
Number of storeys in t		, a to (_/ ,			o (o) to	(1.5)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	1.25 for steel or timber frame or resent, use the value corresponding to			•	ruction			0	(11)
deducting areas of openi		o irie grea	iter wall are	a (aner					
•	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	P x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) = ((16)				0.37	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	ea		(20) = 1 -	[0.075 x (*	19)] =			3 0.78	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	3) x (20) =				0.28	(21)
Infiltration rate modified f	•							0.20	`
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (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		
	•	-	-	-	-	-	-	•	

Adjusted infiltr	ration rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m				_	
0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33]	
<i>Calculate effe</i> If mechanic		•	rate for t	he appli	cable ca	se							(2:
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)			0	(2:
If balanced wit									, , ,			0	(2:
a) If balance	ed mech:	anical ve	entilation	with he	at recove	erv (MV	HR) (24a	a)m = (2)	2b)m + (23b) x [¹	1 – (23c)		(2)
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	ed mech:	ı anical ve	ı entilation	without	heat red	coverv (I	л ИV) (24b)m = (22	2b)m + (;	1 23b)	<u> </u>	J	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h	nouse ex m < 0.5 ×			•	•				5 × (23b))		1	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural if (22b)r	ventilation $m = 1$, the			•	•				0.5]	<u>!</u>	<u>!</u>	_	
24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56]	(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	ld) in box	x (25)				-	
25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56]	(2
3. Heat losse	e and he	at loss i	naramet	or:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Vindows Type	e 1				6.76	x1	/[1/(1.4)+	0.04] =	8.96				(2
Vindows Type	e 2				3.14	x1	/[1/(1.4)+	0.04] =	4.16				(2
Valls Type1	57.	5	16.1	8	41.32	<u>x</u>	0.18	_ = [7.44	$\overline{}$ [(2
Valls Type2	14.8	8	0		14.8	x	0.18	=	2.66	= [$\exists \ \ $	(2
Roof	64.	7	0		64.7	x	0.13	<u> </u>	8.41			= =	(3
otal area of e	elements	, m²			137								(3
for windows and * include the are					alue calcul	ated using	g formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragrapl	h 3.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				39.96	3 (3
leat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	582.3	3 (3
hermal mass	s parame	ter (TMF	= Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design asses an be used inste				construct	ion are no	t known p	recisely the	e indicative	values of	TMP in Ta	able 1f		
hermal bridg				ısina Ar	nendix k	(6.05	(3
details of therm	•	,		Ο.	•	•						6.85	(
otal fabric he			1 7	,-	,			(33) +	(36) =			46.8	1 (3
	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))		
entilation he	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
entilation he	1 100		Ī	00.00	30.35	30.35	30.24	30.57	30.93	31.18	31.44	1	(3
Jan	31.86	31.72	31.05	30.93	30.33		1			ı			(0
Jan	31.86		31.05	30.93	30.33				= (37) + (37)	38)m	<u> </u>	J	(0
Jan 32	31.86		77.87	77.74	77.16	77.16	77.06		= (37) + (37) + (37)	38)m 77.99	78.26]	(0

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.22	1.22	1.21	1.2	1.2	1.19	1.19	1.19	1.2	1.2	1.21	1.21		
	1			I.		ı	ı		Average =	Sum(40) ₁ .	12 /12=	1.2	(40)
Number of da	`	nth (Tab	le 1a)		ı			1	1	i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occ 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.		11		(42)
Annual average Reduce the annual not more that 125	ial average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.33		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea			ctor from	Table 1c x		!	ļ.	ļ.			
(44)m= 92.77	89.39	86.02	82.65	79.27	75.9	75.9	79.27	82.65	86.02	89.39	92.77		
	•	•								m(44) ₁₁₂ =		1012.02	(44)
Energy content o	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1			
(45)m= 137.57	120.32	124.16	108.25	103.87	89.63	83.05	95.31	96.44	112.4	122.69	133.23		_
If instantaneous v	water heati	ina at noint	of use (no	n hot water	r storage)	enter∩in	hoves (46		Total = Su	m(45) ₁₁₂ =	-	1326.91	(45)
		· ·	,		, , , , , , , , , , , , , , , , , , ,		· · ·	, , , I	40.00	104	40.00		(46)
(46)m= 20.64 Water storage	18.05 e loss:	18.62	16.24	15.58	13.44	12.46	14.3	14.47	16.86	18.4	19.98		(46)
Storage volun) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community	heating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage					4.144	<i>,</i> , , ,							
a) If manufac				or is kno	wn (kVVI	n/day):				1.	65		(48)
Temperature										0.	54		(49)
Energy lost from b) If manufact		•			or io not		(48) x (49)) =		0.	89		(50)
Hot water sto			•								0		(51)
If community	•			•		,					<u> </u>		()
Volume factor	r from Ta	ble 2a									0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost from		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	89		(55)
Water storage	e loss cal	culated t	or each	month	_	_	((56)m = ((55) × (41)	m 	_			
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contain	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circui	t loss (ar	nnual) fro	m Table	<u></u>							0		(58)
Primary circui	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is	solar wat	ter 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 loso o	alaulatad	for oach	month ((C1)m	(eo) . (OGE (44	\m						
Combi loss c	1	o each	0	0 1)111 =	00) - 3	000 × (41			Ι ,	Τ ο	Ι ο	1	(61)
(61)m= 0	0						(00)=	0 05	(45)	(40)	(57)	(50)== . (64)==	(01)
	`		157.53				`		` 	` 	ì ´	· (59)m + (61)m 1	(62)
(62)m= 188.5		175.09		154.79	138.91	133.98	146.2		163.32	171.97	184.16]	(62)
Solar DHW inpu (add addition									ar contribu	tion to wate	er neating)		
(63)m= 0	0	0	0	0	applie:	0 see Ap	0		0	0	0	1	(63)
			0		0	1 "]	(00)
Output from v	_		157.50	154.79	120.01	1422.00	146	23 145.73	163.32	171.97	104.16	1	
(64)m= 188.5	166.32	175.09	157.53	154.79	138.91	133.98	146.2			1	184.16	1926.53	(64)
			1.10/1./		- /	- (45)		output from w](04)
Heat gains fr		$\overline{}$				- ` 	·		- ` 	- ` 	- ` 	1] 7	(05)
(65)m= 86.48		82.02	75.42	75.28	69.23	68.36	72.4		78.11	80.22	85.04]	(65)
include (57	')m in cald	culation o	of (65)m	only if c	ylinder	is in the	dwellii	ng or hot v	vater is t	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts									-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 105.55	105.55	105.55	105.55	105.55	105.55	105.55	105.5	55 105.55	105.55	105.55	105.55]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5					
(67)m= 16.46	14.62	11.89	9	6.73	5.68	6.14	7.98	10.71	13.6	15.87	16.92]	(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	lso see Ta	ble 5	•		•	
(68)m= 184.63	186.54	181.71	171.44	158.46	146.27	138.12	136.2	21 141.03	151.31	164.29	176.48]	(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also	see Table	 e 5	•	•	•	
(69)m= 33.55		33.55	33.55	33.55	33.55	33.55	33.5		33.55	33.55	33.55]	(69)
Pumps and fa	ans gains	(Table 5	ia)				•		•		•	1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. e	evaporatio	n (negat	ive valu	es) (Tab	le 5)		<u> </u>	<u> </u>		Į.		1	
(71)m= -84.44	 	-84.44	-84.44	-84.44	-84.44	-84.44	-84.4	4 -84.44	-84.44	-84.44	-84.44]	(71)
Water heating				<u> </u>		1	<u> </u>				<u> </u>	1	
(72)m= 116.24	<u>`</u>	110.25	104.75	101.18	96.15	91.88	97.3	5 99.3	104.99	111.42	114.3	1	(72)
` '			101.70	101110				m + (69)m +				J	()
Total interna (73)m= 374.99		361.52	342.85	324.03	305.76	<u>, , , , , , , , , , , , , , , , , , , </u>	299.		327.56	<u> </u>	365.36	1	(73)
6. Solar gair		301.32	342.03	324.03	303.70	293.0	299.	2 300.7	327.30	343.24	303.30	1	(10)
Solar gains are		using solai	r flux from	Table 6a	and asso	ciated equa	ations to	convert to t	he applica	ble orienta	tion.		
Orientation:		•	Area			ux		g_	по арриос	FF		Gains	
Onomation.	Table 6d		m ²			able 6a		Table 6b	7	able 6c		(W)	
Northeast 0.9x	0.77	x	6.7	76	х	11.28] _x [0.63	x [0.7		23.31	(75)
Northeast 0.9x		X	3.1		x	11.28]	0.63	^ L	0.7	= =	32.48](75)
Northeast 0.9x		x	6.7		x	22.97] ^ L] _x [0.63	^ L	0.7	= -	47.45](75)
Northeast 0.9x] ^ L] _x [믁 ;		=](75)](75)
Northeast 0.9x		X	3.1		×	22.97	:	0.63	× [0.7	=	66.12	-
14011116a51 (J.9X	0.77	X	6.7	' 6	X	41.38	X	0.63	X	0.7	=	85.49	(75)

r							, ,		_				_
Northeast _{0.9x}	0.77	X	3.1	4	X	41.38	X	0.63	X	0.7	=	119.12	(75)
Northeast _{0.9x}	0.77	X	6.7	6	x	67.96	X	0.63	X	0.7	=	140.39	(75)
Northeast _{0.9x}	0.77	X	3.1	4	x	67.96	x	0.63	X	0.7	=	195.64	(75)
Northeast _{0.9x}	0.77	X	6.7	6	X	91.35	X	0.63	X	0.7	=	188.72	(75)
Northeast _{0.9x}	0.77	X	3.1	4	x	91.35	x	0.63	x	0.7	=	262.97	(75)
Northeast _{0.9x}	0.77	X	6.7	'6	x	97.38	x	0.63	X	0.7	=	201.19	(75)
Northeast 0.9x	0.77	х	3.1	4	x	97.38	x	0.63	x	0.7	=	280.36	(75)
Northeast _{0.9x}	0.77	х	6.7	'6	x	91.1	X	0.63	x	0.7	=	188.21	(75)
Northeast _{0.9x}	0.77	х	3.1	4	x	91.1	X	0.63	x	0.7	=	262.27	(75)
Northeast 0.9x	0.77	х	6.7	6	x	72.63	x	0.63	x	0.7	=	150.04	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	72.63	x	0.63	x	0.7		209.08	(75)
Northeast _{0.9x}	0.77	x	6.7	6	x	50.42	x	0.63	x	0.7		104.17	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	50.42	x	0.63	x	0.7	=	145.15	(75)
Northeast _{0.9x}	0.77	x	6.7	6	x	28.07	x	0.63	×	0.7		57.99	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	28.07	х	0.63	x	0.7	-	80.8	(75)
Northeast _{0.9x}	0.77	x	6.7	6	x	14.2	х	0.63	x	0.7	=	29.33	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	14.2	х	0.63	x	0.7	-	40.87	(75)
Northeast _{0.9x}	0.77	х	6.7	6	x	9.21	х	0.63	x	0.7	=	19.04	(75)
Northeast _{0.9x}	0.77	x	3.1	4	x	9.21	х	0.63	x	0.7	=	26.53	(75)
Solar gains in	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m												
(83)m= 55.79	113.57 2	204.61	336.03	451.69	481.55	450.48	359	.13 249.32	138.7	9 70.2	45.56		(83)
Total gains – i	internal and	d solar	(84)m =	(73)m	+ (83)m	, watts						•	
(84)m= 430.78	486.69 5	66.13	678.88	775.72	787.31	744.28	658	.33 558.02	466.3	5 419.44	410.93		(84)
7. Mean inter	rnal temper	rature	(heating	season)								
Temperature	during hea	ating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gair	ns for I	iving are	ea, h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.93	0.8	0.6	0.45	0.5	0.81	0.97	0.99	1		(86)
Mean interna	al temperati	ure in I	iving are	ea T1 (fo	ollow st	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.73	19.88	20.16	20.56	20.85	20.97	20.99	20.	99 20.88	20.49	20.04	19.7		(87)
Temperature	during hea	ating p	eriods ir	rest of	dwellin	a from Ta	able 9). Th2 (°C)		-	•	•	
(88)m= 19.91	 -	19.91	19.92	19.92	19.93	19.93	19.	<u> </u>	19.92	19.92	19.91		(88)
(30)						<u>.</u>				_!			
` ′	tor for gain		est of d	welling	h2 m (s	ee Table	9a)						
Utilisation fac	- T	ns for r			· `	T .	T –	1 0.73	0.95	0.99	1		(89)
Utilisation fac	0.99	ns for r 0.98	0.91	0.74	0.51	0.34	0.4		0.95	0.99	1		(89)
Utilisation faction (89)m= 1 Mean internal	0.99	ns for r 0.98 ure in t	0.91 the rest	0.74 of dwell	0.51 ng T2 (0.34	0.4 eps 3	to 7 in Tabl	e 9c)		I		, ,
Utilisation fac	0.99	ns for r 0.98	0.91	0.74	0.51	0.34	0.4	to 7 in Tabl	e 9c)	18.69	18.19	0.50	(90)
Utilisation factors (89)m= 1 Mean internation (90)m= 18.22	0.99 al temperati	ns for r 0.98 ure in t	0.91 the rest 19.41	0.74 of dwell 19.78	0.51 ing T2 (0.34 follow ste 19.92	0.4 eps 3	to 7 in Tabl 92 19.83	e 9c)		18.19	0.56	, ,
Utilisation factors (89)m= 1 Mean internation (90)m= 18.22 Mean internation factors (189)m= 1	0.99 al temperation 18.44	ns for r 0.98 ure in t 18.86	0.91 the rest 19.41 r the wh	0.74 of dwell 19.78 ole dwe	0.51 ng T2 (19.91	0.34 follow ste 19.92 fLA × T1	0.4 eps 3 19.9	to 7 in Tabl 92 19.83 f fLA) × T2	e 9c) 19.33 LA = Liv	18.69 ving area ÷ (18.19	0.56	(90)
Utilisation factors (89)m= 1 Mean internation (90)m= 18.22	0.99 al temperati 18.44 al temperati 19.24	ns for r 0.98 ure in 1 18.86 ure (fo	0.91 the rest 19.41 r the wh	0.74 of dwell 19.78 ole dwe 20.38	0.51 Ing T2 (19.91 Illing) =	0.34 follow ste 19.92 fLA × T1 20.52	0.4 eps 3 19.9 + (1 20.9	to 7 in Tabl 92 19.83 f - fLA) × T2 52 20.42	e 9c) 19.33 FLA = Liv	18.69 ving area ÷ (4	18.19	0.56	(90)

	(02)
(93)m= 19.06 19.24 19.59 20.05 20.38 20.5 20.52 20.52 20.42 19.98 19.44	19.03 (93)
8. Space heating requirement	no coloniato
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	re-calculate
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 0.91 0.77 0.56 0.4 0.47 0.77 0.96 0.99	1 (94)
Useful gains, hmGm , W = (94)m x (84)m	
	409.16 (95)
Monthly average external temperature from Table 8	(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 1163.59 1128.33 1027.69 868.24 674.71 455.36 302.57 317.27 488.98 728.92 962.65	1160.7 (97)
	1160.7 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m=	559.15
Total per year (kWh/year) = Sum(98)	
Space heating requirement in kWh/m²/year	42.32 (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)	
546.92 434.48 354.47 178.76 59.52 0 0 0 0 210.79 394.19	559.15
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
584.94 464.68 379.11 191.18 63.66 0 0 0 0 225.44 421.59	598.02
Total (kWh/year) =Sum(211) _{15,1012} =	2928.63 (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	0
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)
Water heating	
Output from water heater (calculated above)	
	184.16
Efficiency of water heater	79.8 (216)
(217)m= 87.49 87.26 86.66 85.15 82.51 79.8 79.8 79.8 85.5 86.96	87.59 (217)
Fuel for water heating, kWh/month	
$(219)m = (64)m \times 100 \div (217)m$ $(240)m = (245)m \times 100 \times (217)m$	240.25
(219)m= 215.44 190.6 202.04 185 187.61 174.07 167.89 183.25 182.61 191.03 197.76 Total = Sum(219a) ₁₁₂ =	210.25
	2287.57 (219)
Annual totals Space heating fuel used, main system 1	kWh/year 2928.63
apasaaaanig taat aaaa, mani ayatani i	2020.00

Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue		30 45	(230c) (230e)
Total electricity for the above, kWh/year	sum of (230a	u)(230g) =	75 (231)
Electricity for lighting			290.68 (232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	632.58 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	494.11 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1126.7 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	150.86 (268)
Total CO2, kg/year	sum	of (265)(271) =	1316.49 (272)
TER =			29.93 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.12 Printed on 24 November 2020 at 17:44:44

Project Information:

Assessed By: Vitaliy Troyan (STRO018096) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.8m²

Plot Reference: Site Reference : **Tottenham Mews** 5_03 - 2B3P

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)

Fuel factor: 1.55 (electricity (c))

30.48 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 16.32 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 61.1 kWh/m²

Fail

Excess energy = $1.15 \text{ kg/m}^2 (01.9 \%)$

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.24 kWh/day

Permitted by DBSCG: 2.24 kWh/day

Primary pipework insulated: Yes OK

6 Controls

Charging system linked to use of community heating, programmer and TRVsOK Space heating controls

Hot water controls: Cylinderstat **OK**

OK

Regulations Compliance Report

7 Low energy lights		
	400.00/	
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.48	
Maximum	1.5	ОК
MVHR efficiency:	78%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.51m²	
Windows facing: South East	6.82m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or rolle	er blind
	Closed 100% of daylight hou	ırs
	, 3	
10 Key features		
Air permeablility	3.0 m³/m²h	
Windows U-value	1.1 W/m²K	

Community heating, heat from electric heat pump

Photovoltaic array

		l lser I	Details:						
Assessor Name:	Vitaliy Troyan	- 036 F1	Strom	a Num	ber:		STRO	018096	
Software Name:	Stroma FSAP 2012		Softwa				Versio	n: 1.0.5.12	
Address	F	Property	Address	: 5_03 -	2B3P				
Address: 1. Overall dwelling dime	ensions:								
The Overall awailing all the		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			63.8	(1a) x	2	2.65	(2a) =	169.07	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	63.8	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.07	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	_ = [0	x	20 =	0	(6b)
Number of intermittent fa	ins				0	x -	10 =	0	(7a)
Number of passive vents	3			Ē	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			Ē	0	X 4	40 =	0	(7c)
				<u>L</u>				_	
				_			Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, proced			continuo fi	0		÷ (5) =	0	(8)
Number of storeys in the		50 to (17),	ourier wise (continue n	0111 (9) 10	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t	o the grea	ter wall are	ea (after					
,	floor, enter 0.2 (unsealed) or (.1 (seal	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	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere Shelter factor	20		(20) = 1 -	[0.075 x (*	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		- /1			0.65	(21)
Infiltration rate modified f	•		, , ,	, , ,				0.13	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7			•		•		•	
$(22)m = \begin{bmatrix} 5.1 & 5 \end{bmatrix}$	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (20-) (2	2)m : 4	_	-	-	-	-	-	-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	<u> </u>	1.08	1.12	1.18]	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.93	1 0.32	<u> </u>	1.00	1.12	1.10	J	

djusted 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		
<i>alculate effed</i> If mechanica		_	rate for t	he appli	cable ca	se			-	-	-	0.5	(2
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				66.3	(2
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0.33	0.33	0.32	0.31	0.31	0.29	0.29	0.29	0.3	0.31	0.31	0.32		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (I	ИV) (24b	o)m = (22	2b)m + (23b)		_	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h					•			outside o) m + 0.	5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n					•			loft 2b)m² x	0.5]			•	
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)	-	-	-	-	
5)m= 0.33	0.33	0.32	0.31	0.31	0.29	0.29	0.29	0.3	0.31	0.31	0.32		(2
B. Heat losse	s and he	eat loss i	paramete	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
indows Type	1				3.17	x1	/[1/(1.1)+	0.04] =	3.34				(2
indows Type	2				6.82	x1	/[1/(1.1)+	0.04] =	7.19				(2
alls Type1	81.0	6	16.3	3	65.27	×	0.2	=	13.05				(2
alls Type2	15.0	6	0		15.6	X	0.19	=	2.89				(2
oof	62		0		62	X	0.14	=	8.68				(3
otal area of e	lements	, m²			159.2	2							(;
or windows and include the area						ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	n 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				41.83	(:
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	558	(;
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess In be used inste				construct	ion are no	t known pi	ecisely the	e indicative	values of	TMP in Ta	able 1f		
nermal bridge				usina Ap	pendix ł	<						23.88	(3
details of therma	`	,		• .	•								
otal fabric he	at loss							(33) +	(36) =			65.71	(
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]	
3)m= 18.47	18.29	18.12	17.23	17.05	16.16	16.16	15.98	16.51	17.05	17.4	17.76		(;
eat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
												-	
9)m= 84.18	84	83.82	82.93	82.76	81.87	81.87	81.69	82.22	82.76	83.11	83.47		

nergy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 136.64	1.3 005.13 317.89
Sample of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	005.13
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	005.13
Water heating energy requirement: KWh/year:	005.13
**Sumed occupancy, N	005.13
sumed 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 inual average hot water usage in litres per day Vd, average = (25 x N) + 36 duce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of 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 t water usage in litres per day for each month Vd, m = factor from Table 1c x (43))m= 92.14 88.79 85.44 82.09 78.74 75.39 75.39 78.74 82.09 85.44 88.79 92.14 Total = Sum(44) ₁₁₂ = 11 ergy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d))m= 136.64 119.5 123.32 107.51 103.16 89.02 82.49 94.66 95.79 111.63 121.85 132.33 Total = Sum(45) ₁₁₂ = 1: instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) community heating and no tank in dwelling, enter 110 litres in (47) herwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ater storage loss:	005.13
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 Inual average hot water usage in litres per day Vd, average = (25 x N) + 36 duce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of 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 It water usage in litres per day for each month Vd, m = factor from Table 1c x (43) In Page 14 88.79 85.44 82.09 78.74 75.39 75.39 78.74 82.09 85.44 88.79 92.14 Total = Sum(44): = Page 20.14 88.79 85.44 82.09 78.74 75.39 75.39 78.74 82.09 85.44 88.79 92.14 Total = Sum(44): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total = Sum(45): = In Page 20.15 17.93 18.5 16.13 15.47 13.35 12.37 14.2 14.37 16.74 18.28 19.85 Total	005.13
duce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of the 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 the water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month Vd,m = factor from Table 1c x (43) Image: person per day for each month vertical person p	005.13 (
t water usage in litres per day for each month Vd,m = factor from Table 1c x (43) m = 92.14	317.89
March Marc	317.89
Total = Sum(44) ₁₁₂ = 10 argy content of hot water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 \times Wh/month$ (see Tables 1b, 1c, 1d) Total = Sum(44) ₁₁₂ = 11 argument of the water used - calculated monthly = $4.190 \times Vd$, $m \times nm \times DTm / 3600 \times Wh/month$ (see Tables 1b, 1c, 1d) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 11 argument o	317.89
ergy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 136.64	317.89
136.64 119.5 123.32 107.51 103.16 89.02 82.49 94.66 95.79 111.63 121.85 132.33	
Stantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) Total = Sum(45) ₁₁₂ = 1: 1: 1: 1: 1: 1: 1: 1:	
stantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) m =	
orage volume (litres) including any solar or WWHRS storage within same vessel community heating and no tank in dwelling, enter 110 litres in (47) nerwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) atter storage loss:	,
orage volume (litres) including any solar or WWHRS storage within same vessel community heating and no tank in dwelling, enter 110 litres in (47) nerwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ater storage loss:	(
ommunity heating and no tank in dwelling, enter 110 litres in (47) nerwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) atter storage loss:	(
nerwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ater storage loss:	(
It manufacturer's declared loss tactor is known (k)//h/dov/).	
If manufacturer's declared loss factor is known (kWh/day): 2.24	(
mperature factor from Table 2b ergy lost from water storage, kWh/year (48) x (49) = 1.34	(
ergy lost from water storage, kWh/year (48) x (49) = 1.34 If manufacturer's declared cylinder loss factor is not known:	(
t water storage loss factor from Table 2 (kWh/litre/day)	(
ommunity heating see section 4.3 lume factor from Table 2a	
mperature factor from Table 2b	(
ergy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(
nter (50) or (54) in (55)	(
ater storage loss calculated for each month $((56)m = (55) \times (41)m$	
m= 41.66 37.63 41.66 40.32 41.66 40.32 41.66 40.32 41.66 40.32 41.66	(
/linder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
m= 41.66 37.63 41.66 40.32 41.66 40.32 41.66 40.32 41.66 40.32 41.66	(
mary circuit loss (annual) from Table 3	(
mary 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)	

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m												
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	0	0 1)111 =	00) + 3	05 × (41)	0	0	0	T 0	0	1	(61)
Total heat required f										<u> </u>	[(50)m + (61)m	(-)
(62)m= 201.56 178.1		170.34	168.09	151.85	147.42	159.5		176.56	184.69	197.25	(39)111 + (01)111	(62)
Solar DHW input calculat											I	(/
(add additional lines								Continou	tion to wate	or ricating)		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from water h	 eater	<u> </u>	<u> </u>		<u> </u>	l		<u> </u>		<u> </u>	ı	
(64)m= 201.56 178.1		170.34	168.09	151.85	147.42	159.5	8 158.62	176.56	184.69	197.25]	
· · <u>L L </u>	-1	<u> </u>	l			0	utput from w	ater heate	er (annual) ₁	l12	2082.35	(64)
Heat gains from wat	er heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m] + 0.8 x	k [(46)m	ı + (57)m	+ (59)m	1	•
(65)m= 97.37 86.69		86.01	86.24	79.86	79.37	83.4		89.06	90.78	95.94	اً	(65)
include (57)m in c	alculation	of (65)m	only if c	vlinder i	s in the o	dwellir	g or hot w	ater is f	rom com	munity h	ı neating	
5. Internal gains (s				•						,		
Metabolic gains (Tal			,									
Jan Fe		Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 104.34 104.3	4 104.34	104.34	104.34	104.34	104.34	104.3	4 104.34	104.34	104.34	104.34]	(66)
Lighting gains (calcu	lated in A	ppendix	L, equati	on L9 o	r L9a), a	lso se	e Table 5				•	
(67)m= 16.26 14.4	11.75	8.89	6.65	5.61	6.06	7.88	10.58	13.43	15.68	16.71		(67)
Appliances gains (ca	ılculated iı	n Append	dix L, eq	uation L	13 or L1	3a), a	so see Ta	ble 5	•	•	•	
(68)m= 182.42 184.3	1 179.54	169.39	156.57	144.52	136.47	134.5	8 139.35	149.5	162.32	174.37		(68)
Cooking gains (calc	ılated in A	ppendix	L, equat	ion L15	or L15a)), also	see Table	5	•	•	•	
(69)m= 33.43 33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43		(69)
Pumps and fans gai	ns (Table	5a)			•		•		•	•	•	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evapora	tion (nega	tive valu	es) (Tab	le 5)	•		•	•	•		•	
(71)m= -83.47 -83.4	7 -83.47	-83.47	-83.47	-83.47	-83.47	-83.4	7 -83.47	-83.47	-83.47	-83.47		(71)
Water heating gains	(Table 5)	•					-		-		•	
(72)m= 130.88 128.9	4 124.92	119.46	115.92	110.92	106.68	112.1	2 114.05	119.7	126.09	128.95]	(72)
Total internal gains	=	•		(66))m + (67)m	ı + (68)ı	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 383.86 382	370.52	352.04	333.43	315.36	303.52	308.8	8 318.28	336.94	358.39	374.34		(73)
6. Solar gains:	•				•	•		•	•			
Solar gains are calculat	ed using sola	r flux from	Table 6a	and assoc	iated equa	itions to	convert to th	ne applica	ble orienta	tion.		
Orientation: Access		Area		Flu			g_ T-1-101-	_	FF		Gains	
Table -	od	m²		1a	ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast _{0.9x} 0.	77 ×	3.	17	X 1	11.28	x	0.44	x	0.8	=	26.17	(75)
Northeast _{0.9x} _{0.}	77 ×	3.	17	x	22.97	x	0.44	x	0.8	=	53.28	(75)
Northeast _{0.9x} 0.	77 X	3.′	17	X Z	11.38	×	0.44	×	0.8	=	95.99	(75)
Northeast 0.9x 0.	77 x	3.	17	x (67.96	_ x	0.44	x	0.8	=	157.65	(75)
Northeast _{0.9x} 0.	77 ×	3.1	17	x (91.35	x	0.44	x	0.8	=	211.91	(75)

							_					r	_
Northeast _{0.9x}	0.77	X	3.1	7	× L	97.38	X	0.44	X	0.8	=	225.92	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	91.1	X	0.44	X	0.8	=	211.34	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	72.63	X	0.44	X	0.8	=	168.48	(75)
Northeast _{0.9x}	0.77	Х	3.1	7	x	50.42	X	0.44	X	0.8	=	116.97	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	28.07	X	0.44	X	0.8	=	65.11	(75)
Northeast _{0.9x}	0.77	X	3.1	7	x	14.2	x	0.44	X	0.8		32.93	(75)
Northeast 0.9x	0.77	X	3.1	7	x	9.21	x	0.44	X	0.8		21.38	(75)
Southeast _{0.9x}	0.77	X	6.8	32	x	36.79	x	0.44	x	0.8	=	61.21	(77)
Southeast _{0.9x}	0.77	X	6.8	32	x	62.67	x	0.44	x	0.8	=	104.27	(77)
Southeast 0.9x	0.77	X	6.8	32	x	85.75	x	0.44	X	0.8	=	142.66	(77)
Southeast _{0.9x}	0.77	X	6.8	32	x [106.25	×	0.44	x	0.8		176.76	(77)
Southeast _{0.9x}	0.77	X	6.8	32	x [119.01	×	0.44	x	0.8	_	197.99	(77)
Southeast 0.9x	0.77	x	6.8	32	x [118.15	×	0.44	X	0.8	-	196.56	(77)
Southeast 0.9x	0.77	x	6.8	32	x [113.91	X	0.44	x	0.8		189.5	(77)
Southeast 0.9x	0.77	х	6.8	32	x T	104.39	×	0.44	x	0.8	-	173.67	(77)
Southeast 0.9x	0.77	X	6.8	32	x T	92.85	X	0.44	X	0.8	=	154.47	(77)
Southeast 0.9x	0.77	X	6.8	32	x [69.27	×	0.44	x	0.8	=	115.24	(77)
Southeast 0.9x	0.77	х	6.8	32	x [44.07	×	0.44	x	0.8	=	73.32	(77)
Southeast 0.9x	0.77	X	6.8	32	x [31.49	×	0.44	×	0.8		52.38	(77)
_					_		_						
Solar gains in	watts, ca	lculated	for eacl	h month	1		(83)m	n = Sum(74)m .	(82)m				
(83)m= 87.39	157.55	238.65	334.41	409.9	_	2.48 400.84	342	.15 271.44	180.35	106.25	73.76	1	(83)
1 1	1				1	- I		.10 27 1.77	100.50	100.23	1 75.70		(00)
Total gains – i	nternal ar			= (73)m			1	.10 271.44	100.50	100.23	73.70	J	(03)
	nternal ar			= (73)m 743.33	+ (8				517.29	-	448.1]	(84)
Total gains – i	539.55	nd solar 609.17	(84)m = 686.46	743.33	+ (8	3)m , watts				-	l]	
Total gains – i (84)m= 471.25	539.55	nd solar 609.17	(84)m = 686.46 (heating	743.33 season	+ (83 737	3)m , watts 7.83 704.36	651	.03 589.72		-	l	21	
Total gains – i (84)m= 471.25 7. Mean inter	539.55 rnal tempe during he	nd solar 609.17 erature (eating po	(84)m = 686.46 (heating eriods in	743.33 season the livi	+ (83 733 ng a	3)m , watts 7.83 704.36 area from Ta	651 able 9	.03 589.72		-	l	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature	539.55 rnal tempe during he	nd solar 609.17 erature (eating po	(84)m = 686.46 (heating eriods in	743.33 season the livi	737 737 ng a	3)m , watts 7.83 704.36 area from Ta	651 able 9	.03 589.72		464.64	l	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac	539.55 rnal tempe during he ctor for ga	erature eating pains for li	(84)m = 686.46 (heating eriods in iving are	743.33 season the livi	+ (83) 73) ng an (se	3)m , watts 7.83 704.36 area from Table 9a	651 able 9	.03 589.72 , Th1 (°C)	517.29	464.64	448.1	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.95	tempe during he ctor for ga Feb	erature (eating points for limits of limits) Mar 0.9	(84)m = 686.46 (heating eriods in iving are Apr 0.83	743.33 season the livi ea, h1,m May 0.72	+ (83) 737 ng an (se	3)m , watts 7.83	651 able 9	.03 589.72 , Th1 (°C) ug Sep 5 0.7	517.29 Oct	9 464.64 Nov	448.1 Dec	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation face	tempe during he ctor for ga Feb	erature (eating points for limits of limits) Mar 0.9	(84)m = 686.46 (heating eriods in iving are Apr 0.83	743.33 season the livi ea, h1,m May 0.72	+ (83 733 73 73 73 73 73 73 73 73 73 73 73 7	3)m , watts 7.83	651 able 9	.03 589.72 , Th1 (°C) ug Sep 5 0.7	517.29 Oct	Nov 0.93	448.1 Dec	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.95 Mean internations (87)m= 18.47	tempera 18.75	erature eating pains for li Mar 0.9 ature in l	(84)m = 686.46 (heating eriods ir iving are 0.83 iving are 19.84	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38	+ (8: 73: 73: 73: 73: 73: 73: 73: 73: 73: 73	3)m , watts 7.83	able 9 A 0. 7 in T	.03 589.72 , Th1 (°C) ug Sep 5 0.7 Table 9c) 87 20.58	517.29 Oct 0.86	Nov 0.93	448.1 Dec 0.96	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.95 Mean interna (87)m= 18.47 Temperature	temperature of the state of the	erature (eating points for limited for lim	(84)m = 686.46 (heating eriods in iving are 0.83 iving are 19.84 eriods in	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38	+ (8: 73: 73: 73: 73: 73: 73: 73: 73: 73: 73	3)m , watts 7.83	A 0. 7 in 1 20. Table 9	.03 589.72 , Th1 (°C) ug Sep 5 0.7 Table 9c) 87 20.58 9, Th2 (°C)	Oct 0.86	Nov 0.93	Dec 0.96	21	(84)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83	temperature of the second seco	erature (eating points for line) Mar 0.9 ature in line) 19.23 eating points and points for line)	(84)m = 686.46 (heating eriods in iving are 19.84 eriods in 19.84	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of	+ (8: 73: 1) ng a n (se 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	3)m , watts 7.83	A 0. 7 in 1 20. Table 9	.03 589.72 , Th1 (°C) ug Sep 5 0.7 Table 9c) 87 20.58 9, Th2 (°C)	517.29 Oct 0.86	Nov 0.93	448.1 Dec 0.96	21	(84) (85) (86) (87)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fac	say.55 during he tor for ga	erature eating pains for line 19.23 eating pains for rature in land 19.83 eating pains for rature in land 19	(84)m = 686.46 (heating eriods ir iving are 0.83 iving are 19.84 eriods ir 19.84 est of decrease of de	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 rest of 19.84 welling,	+ (8: 73: 1) ng a n (se J 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	3)m , watts 7.83	A 0. 7 in 7 20. Table 9 19. e 9a)	.03 589.72 , Th1 (°C) ug Sep 5 0.7 Table 9c) 87 20.58 9, Th2 (°C) 86 19.85	Oct 0.86	Nov 0.93 19.08	Dec 0.96 18.41	21	(84) (85) (86) (87) (88)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fac (89)m= 0.94	say.55 during he stor for ga set or for ga set of for ga set of says set or for ga set of says set or for ga set o	erature (eating pains for line) Mar 0.9 eature in language 19.83 eating pains for range 19.83	(84)m = 686.46 (heating eriods ir iving are 19.84 eriods ir 19.84 est of do 0.8	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of 19.84 welling, 0.67	+ (8: 73: 73: 73: 73: 73: 73: 73: 73: 73: 73	3)m , watts 7.83	A 0. 7 in 7 20. 5 able 9 19. 6 9a) 7 0.	.03 589.72 .03 589.72 .04 (°C) .05 Sep .05 0.7 .06 Sep .07 Sep .07 Sep .07 Sep .08 Sep .08 Sep .09 Sep .00 S	Oct 0.86 19.89 0.83	Nov 0.93	Dec 0.96	21	(84) (85) (86) (87)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac [86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fac (89)m= 0.94 Mean interna	tempera start of the start of t	erature eating pains for line 19.23 eating pains for rouse 19.83 eating pains for rouse 19.83 eating pains for rouse 19.88 eature in the eating pains for rouse 19.88	(84)m = 686.46 (heating eriods in iving are 19.84 eriods in 19.84 est of do 0.8 the rest	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of 19.84 welling, 0.67 of dwell	+ (8: 73: 1) ng a n (se	3)m , watts 7.83	6 651 A 0. 7 in 7 20. able 9 19. e 9a) 0. teps 3	.03 589.72 , Th1 (°C) ug Sep 5 0.7 Table 9c) 87 20.58 9, Th2 (°C) 86 19.85 4 0.63 to 7 in Tabl	Oct 0.86 19.89 19.84 0.83 e 9c)	Nov 0.93 19.08 19.84	Dec 0.96 18.41 19.83	21	(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac Jan (86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fac (89)m= 0.94	say.55 during he stor for ga set or for ga set of for ga set of says set or for ga set of says set or for ga set o	erature (eating pains for line) Mar 0.9 eature in language 19.83 eating pains for range 19.83	(84)m = 686.46 (heating eriods ir iving are 19.84 eriods ir 19.84 est of do 0.8	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of 19.84 welling, 0.67	+ (8: 73: 1) ng a n (se 0. 0) dwe 19 h2,n 0. ing 7	3)m , watts 7.83	A 0. 7 in 7 20. 5 able 9 19. 6 9a) 7 0.	.03 589.72 .03 589.72 .04 CC) .05 CC) .07 Cable 9c) .07 20.58 .09 Th2 (°C) .08 19.85 .09 4 0.63 .09 19.45	Oct 0.86 19.89 19.84 0.83 e 9c) 18.53	Nov 0.93 19.08 19.84 0.92	Dec 0.96 18.41 19.83 0.95		(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac [86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fac (89)m= 0.94 Mean interna	tempera start of the start of t	erature eating pains for line 19.23 eating pains for rouse 19.83 eating pains for rouse 19.83 eating pains for rouse 19.88 eature in the eating pains for rouse 19.88	(84)m = 686.46 (heating eriods in iving are 19.84 eriods in 19.84 est of do 0.8 the rest	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of 19.84 welling, 0.67 of dwell	+ (8: 73: 1) ng a n (se 0. 0) dwe 19 h2,n 0. ing 7	3)m , watts 7.83	6 651 A 0. 7 in 7 20. able 9 19. e 9a) 0. teps 3	.03 589.72 .03 589.72 .04 CC) .05 CC) .07 Cable 9c) .07 20.58 .09 Th2 (°C) .08 19.85 .09 4 0.63 .09 19.45	Oct 0.86 19.89 19.84 0.83 e 9c) 18.53	Nov 0.93 19.08 19.84	Dec 0.96 18.41 19.83 0.95	21	(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fac [86)m= 0.95 Mean interna (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fac (89)m= 0.94 Mean interna	say.55 during he tor for gar 18.75 during he 19.83 ctor for gar 16.89	erature eating pains for li Mar 0.9 eature in l 19.23 eating pains for r 0.88 eature in t 17.57	(84)m = 686.46 (heating eriods ir iving are 19.84 eriods ir 19.84 est of do 0.8 the rest 18.44	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of 19.84 welling, 0.67 of dwell 19.16	+ (8: 73: 1) ng a n (se J 0. 0llow 20 dwee 19 n 19 19	3)m , watts 7.83	A 0. 7 in 7 20. able 9 19. teps 3 19.	.03 589.72 .03 589.72 .04 (°C) .05 Sep .07 Sep .07 Sep .07 Sep .08 Sep .08 Sep .09 Sep .00 S	Oct 0.86 19.89 19.84 0.83 e 9c) 18.53	Nov 0.93 19.08 19.84 0.92	Dec 0.96 18.41 19.83 0.95		(84) (85) (86) (87) (88) (89)
Total gains – i (84)m= 471.25 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.95 Mean internat (87)m= 18.47 Temperature (88)m= 19.83 Utilisation fact (89)m= 0.94 Mean internat (90)m= 16.48	say.55 during he tor for gar 18.75 during he 19.83 ctor for gar 16.89 delication of the tor for gar 17.92 delication of the temperature of the tem	erature eating pains for I 19.23 eating pains for I 19.83 eating pains for I 17.57 eature (for 18.49	(84)m = 686.46 (heating eriods ir iving are 19.84 eriods ir 19.84 est of do 0.8 the rest 18.44 r the wh	743.33 season the livi ea, h1,m May 0.72 ea T1 (for 20.38 n rest of 19.84 welling, 0.67 of dwell 19.16 ole dwell 19.84	+ (8: 73: 1) ng a n (se J 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	3)m , watts 7.83	6 651 able 9 A 0. 7 in 1 20. able 9 19. teps 3 1 + (1 20.	.03 589.72 .03 589.72 .04 (°C) .05 0.7 .05 0.7 .05	Oct 0.86 19.89 19.84 0.83 e 9c) 18.53 LA = Liv	Nov 0.93 19.08 19.84 0.92 17.38 ring area ÷ (4	Dec 0.96 18.41 19.83 0.95		(84) (85) (86) (87) (88) (89)

												1	
(93)m= 17.58	17.92	18.49	19.22	19.84	20.25	20.41	20.38	20.08	19.29	18.32	17.52		(93)
8. Space hea													
Set Ti to the i 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 fac	l		<u> </u>	iviay	<u> </u>	<u> </u>	_ / tug	СОР	000	1101	200		
(94)m= 0.92	0.9	0.86	0.78	0.67	0.53	0.41	0.45	0.64	0.81	0.9	0.93		(94)
Useful gains,	hmGm	, W = (9	4)m x (84	4)m	ı							l	
(95)m= 435.18	484.7	521.44	536.27	499.9	393.57	286.36	292.36	378.58	420.82	417.12	416.93		(95)
Monthly avera	age exte	rnal tem	perature	from T	able 8							1	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate		1	· ·		i	-``	· · ·	– (96)m]			l	
(*)		1004.99		673.4	462.51	311.56	325.13	491.33	718.94	932.61	1112.13		(97)
Space heatin		1	1		I	I				r -	l 1		
(98)m= 508.22	409.39	359.76	229.96	129.08	0	0	0	0	221.8	371.16	517.23		7
							Tota	l per year	(kWh/yeai	') = Sum(9	8) _{15,912} =	2746.61	(98)
Space heatin	g requir	ement in	kWh/m²	² /year								43.05	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is us										unity sch	neme.		7 ,,,,,
Fraction of spa			•		-	_	(Table T	1) 'U' IT N	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; ti	he latter	
includes boilers, h Fraction of hea		-			rom powei	r stations.	See Appei	naix C.				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	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for d	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	g											kWh/yea	
Annual space	_	requiren	nent									2746.61	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	2883.94	(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 _l	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	1										•		_
Annual water h		equirem	ent									2082.35	
If DHW from c													_ _
Water heat fro		•)				(64) x (30	03a) x (30	5) x (306) :	=	2186.46	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)([310e)] =	50.7	(313)
Cooling Syster	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							ادامند				i		7(200=)
mechanical ve	ntilation	- paland	ea, extra	act or po	sitive in	put trom	outside					123.76	(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) =	123.76	(331)
Energy for lighting (calculated in Appendix L)			287.21	(332)
Electricity generated by PVs (Appendix M) (ne	gative quantity)		-484.13	(333)
Electricity generated by wind turbine (Appendi	x M) (negative quantity)		0	(334)
12b. CO2 Emissions – Community heating sch	neme			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water he Efficiency of heat source 1 (%)	eating (not CHP) If there is CHP using two fuels repeat (363) to	(366) for the second fue	el 250	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	1052.61	(367)
Electrical energy for heat distribution	[(313) x	0.52	26.32	(372)
Total CO2 associated with community systems	S (363)(366) + (368)(372	2) =	1078.93	(373)
CO2 associated with space heating (secondar	y) (309) x	0	0	(374)
CO2 associated with water from immersion he	ater or instantaneous heater (312) x	0.52	0	(375)
Total CO2 associated with space and water he	eating (373) + (374) + (375) =		1078.93	(376)
CO2 associated with electricity for pumps and	fans within dwelling (331)) x	0.52	64.23	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	149.06	(379)
Energy saving/generation technologies (333) t	o (334) as applicable	0.52 x 0.01 =	-251.26	(380)
Total CO2, kg/year	(376)(382) =		1040.96	(383)
Dwelling CO2 Emission Rate (383)	- (4) =		16.32	(384)

El rating (section 14)

(385)

87.18

			User D	otoile:						
	\". " T		USEI L					OTDO	040000	
Assessor Name: Software Name:	Vitaliy Troyan Stroma FSAP 201	2		Strom: Softwa					018096 on: 1.0.5.12	
Software Name.	Ottoma i OAI 201		operty ,	Address				VCISIC	71. 1.0.5.12	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)	7(0-)	Volume(m ³	<u>-</u>
	\ (41\) (4\) (4\) (4\)	\			(1a) x	2	.65	(2a) =	169.07	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)) [63.8	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	169.07	(5)
2. Ventilation rate:	main s	econdary	,	other		total			m³ per hou	ır
N. sala and A.P. sala a	heating h	neating	, –		, –			40		_
Number of chimneys	0 +	0]	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0] + L	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	2	X '	10 =	20	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6	(a)+(6b)+(7a	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.12	(8)
If a pressurisation test has b	•				ontinue fr			- (0) =	0.12	(0)
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber resent, use the value corres				•	uction			0	(11)
deducting areas of openi		sponding to	ırıe great	er wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.1	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 s	tripped							0	(14)
Window infiltration				0.25 - [0.2		_			0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil						is heina u	sad		0.37	(18)
Number of sides sheltere		s been done	or a dog	gree an per	meability	is being u	3CU		2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.31	(21)
Infiltration rate modified f	or monthly wind speed	t								
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									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
` '						L			J	

0.4	ation rate	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37]	
alculate effe		•	rate for t	he appli	cable ca	se	l	!					
If mechanic												0	(2
If exhaust air h) = (23a)			0	(2
If balanced wit		-	-	_								0	(2
a) If balance						- 		í `	, 		``) ÷ 100] 1	10
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	1						r Ó Ì	í `	r Ó T		ı	1	,
b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
c) If whole h				•	•				F (00h	.\			
	$n < 0.5 \times 10^{-6}$	(23b), t	nen (240	(230)	o); otnerv	wise (24)	C) = (220)	o) m + 0.	.5 × (230	0	0	1	(
-,										0	0]	(-
d) If natural if (22b)r	ventilation = 1, the				•				0.5]				
ld)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				J	
5)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(
. Heat losse	_	·			N.				A 37.1.1				A 37 I
EMENT	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
indows Type		,			3.1		/[1/(1.4)+	0.04] =	4.11	<u></u>			(
indows Type	e 2				6.66	x ₁ ,	/[1/(1.4)+	· 0.04] =	8.83	=			(:
alls Type1	81.6	6	15.90	3	65.64	. x	0.18		11.82	=			· · · · · · · · · · · · · · · · · · ·
alls Type2	15.6		0		15.6	=	0.18	-	2.81				(
oof	62		0	_	62	$=$ $\frac{1}{x}$	0.13	=	8.06	ᆿ ¦		- -	(
tal area of e						=	0.13		0.00				
or windows and			offoctivo wi	ndow I I ve	159.2		ı formula 1	/[/1/ L val	(0) 1 0 041 6	e aivon in	naragrani	h 2 2	(
nclude the are						ateu using	i ioiiiiuia i	/[(1/ U- vaic	1 0)+0.04] a	is giveri iii	paragrapi	13.2	
bric heat lo	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				43.8	4 (
at capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	558	(
	parame	ter (TMF	c = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(
ermal mass	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
		tailed calc	ulation									_	
r design asses n be used inste												7.96	(
r design asses n be used inste ermal bridg	es : S (L	x Y) cal	culated (٠.	•	<							
r design asses n be used inste nermal bridg letails of therm	es : S (L al bridging	x Y) cal	culated (٠.	•	<		(22) 1	(36) -				
r design asses n be used inste ermal bridg letails of therm tal fabric he	es : S (L al bridging eat loss	x Y) cal	culated (= 0.05 x (3	•	<			(36) =	25)m v (F)		51.8	(
r design asses to be used inste termal bridg letails of therm tal fabric he	es : S (L al bridging eat loss at loss ca	x Y) calcare not kn	culated (own (36) =	= 0.05 x (3	1)		۸	(38)m	= 0.33 × (i	51.8	(1
r design asses in be used inste ermal bridg letails of therm ital fabric he entilation he	es : S (L al bridging eat loss at loss ca	x Y) calc are not kn alculated Mar	culated (own (36) = I monthly Apr	- 0.05 x (3 / May	Jun	Jul	Aug	(38)m Sep	= 0.33 × (Nov	Dec	51.8	
r design asses n be used inste nermal bridg letails of therm atal fabric he entilation he Jan 32.34	es : S (L al bridging eat loss at loss ca Feb 32.17	x Y) calc are not kn alculated Mar 32	culated (own (36) =	= 0.05 x (3	1)		Aug 30.24	(38)m Sep 30.63	= 0.33 × (Oct 31.06	Nov 31.36	i	51.8	
r design asses in be used inste nermal bridg letails of therm otal fabric he entilation he	es : S (L al bridging eat loss at loss ca Feb 32.17	x Y) calc are not kn alculated Mar 32	culated (own (36) = I monthly Apr	- 0.05 x (3 / May	Jun	Jul		(38)m Sep 30.63	= 0.33 × (Nov 31.36	Dec	51.8	(:

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.32	1.32	1.31	1.3	1.3	1.29	1.29	1.29	1.29	1.3	1.3	1.31		
				ı		ı	ı		Average =	Sum(40) ₁ .	12 /12=	1.3	(40)
Number of day	1	nth (Tab	le 1a)					1	1	i			
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 heat	ting ene	rgy requi	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.		09		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.76		(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		<u>'</u>	!	!	<u> </u>		
(44)m= 92.14	88.79	85.44	82.09	78.74	75.39	75.39	78.74	82.09	85.44	88.79	92.14		
										m(44) ₁₁₂ =	L	1005.13	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 136.64	119.5	123.32	107.51	103.16	89.02	82.49	94.66	95.79	111.63	121.85	132.33		_
If instantaneous w	vater heati	na at noint	of use (no	n hot water	· storage)	enter∩in	hoves (46		Total = Su	m(45) ₁₁₂ =	- [1317.89	(45)
			,	ı	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , ,	40.74	40.00	40.05		(46)
(46)m= 20.5 Water storage	17.93 loss:	18.5	16.13	15.47	13.35	12.37	14.2	14.37	16.74	18.28	19.85		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)				'		
Otherwise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage					4.144	<i>,</i> , , ,							
a) If manufact				or is kno	wn (kVVI	n/day):				1.	65		(48)
Temperature f										0.	54		(49)
Energy lost fro b) If manufact		•			or io not		(48) x (49)) =		0.	89		(50)
Hot water stor			•								0		(51)
If community h	•			•		,							, ,
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (` , ` `	,								0.	89		(55)
Water storage	loss cal	culated t	for each	month		_	((56)m = ((55) × (41)	m 	_	_		
(56)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	x H	
(57)m= 27.66	24.99	27.66	26.77	27.66	26.77	27.66	27.66	26.77	27.66	26.77	27.66		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter 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	aalaulatad	for oach	manth ((64)m	(CO) + 2(SE (41)	١,,,,						
Combi loss (61)m= 0	0 0	or each	0	0 1)m =	(6U) ÷ 30	05 × (41)	0	T 0	0	0	0	1	(61)
			<u> </u>				<u> </u>		<u> </u>	<u> </u>		(50)m + (61)m	(0.)
(62)m= 187.5		174.24	156.79	154.09	138.3	133.41	145.58		162.56	171.14	183.25	· (59)m + (61)m]	(62)
Solar DHW inp		<u> </u>]	(02)
(add additio									ii continbut	ion to wate	er rieatirig)		
(63)m= 0	0	0	0	0	0	0	0	T 0	0	0	0	1	(63)
Output from	water hea	ter				ļ		1				J	
(64)m= 187.5		174.24	156.79	154.09	138.3	133.41	145.58	145.07	162.56	171.14	183.25]	
		<u> </u>				<u> </u>	Ou	tput from w	ater heate	<u>I</u> r (annual)₁	12	1917.5	(64)
Heat gains f	rom water	heating,	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	n]	-
(65)m= 86.1	1	81.74	75.17	75.04	69.03	68.17	72.21	71.28	77.86	79.94	84.74	ĺ	(65)
include (5	7)m in cal	culation (of (65)m	onlv if c	vlinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	•						•				,	<u> </u>	
Metabolic ga													
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 104.3	34 104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	104.34	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				-	
(67)m= 16.2	6 14.44	11.75	8.89	6.65	5.61	6.06	7.88	10.58	13.43	15.68	16.71]	(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		•	-	
(68)m= 182.4	12 184.31	179.54	169.39	156.57	144.52	136.47	134.58	139.35	149.5	162.32	174.37		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also s	see Table	5			-	
(69)m= 33.4	3 33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43	33.43]	(69)
Pumps and	fans gains	(Table 5	 ба)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	-					-	_	
(71)m= -83.4	7 -83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47	-83.47]	(71)
Water heating	ng gains (T	able 5)	-	-		-	-	-	-	-	-	-	
(72)m= 115.8	32 113.89	109.87	104.41	100.86	95.87	91.62	97.06	98.99	104.65	111.03	113.9]	(72)
Total intern	al gains =				(66))m + (67)m	ı + (68)m	ı + (69)m +	(70)m + (7	(1)m + (72))m	-	
(73)m= 371.8	369.95	358.46	339.99	321.38	303.3	291.46	296.82	306.22	324.89	346.34	362.28]	(73)
6. Solar ga	ins:												
Solar gains a	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	ne applicat	ole orientat	tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains	
					Tal	ole da	. –	Table 6b	_ '	able 60		(W)	,
Northeast 0.9		X	3.	1	x 1	1.28	X	0.63	x	0.7	=	32.07	(75)
Northeast 0.9	0	X	3.	1	X 2	22.97	X	0.63	x	0.7	=	65.28	(75)
Northeast 0.9		X	3.	1	X 4	11.38	X	0.63	×	0.7	=	117.61	(75)
Northeast 0.9		X	3.	1	x 6	67.96	x	0.63	x	0.7	=	193.14	(75)
Northeast 0.9	x 0.77	X	3.	1	x 9	91.35	X	0.63	X	0.7	=	259.62	(75)

		_			_					_				_
Northeast _{0.9x}	0.77	X	3.	1	X	97	7.38	X	0.63	X	0.7	=	276.79	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	9	1.1	X	0.63	X	0.7	=	258.93	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	72	2.63	X	0.63	X	0.7	=	206.42	(75)
Northeast _{0.9x}	0.77	X	3.	1	X	50).42	X	0.63	X	0.7	=	143.31	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	28	3.07	x	0.63	X	0.7	=	79.77	(75)
Northeast _{0.9x}	0.77	X	3.	1	x	1	4.2	X	0.63	X	0.7	=	40.35	(75)
Northeast 0.9x	0.77	x	3.	1	x	9	.21	X	0.63	X	0.7	=	26.19	(75)
Southeast _{0.9x}	0.77	x	6.6	66	x	36	6.79	X	0.63	X	0.7	=	74.89	(77)
Southeast _{0.9x}	0.77	x	6.6	66	x	62	2.67	X	0.63	X	0.7	=	127.56	(77)
Southeast 0.9x	0.77	x	6.6	66	x	85	5.75	X	0.63	X	0.7	=	174.54	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	10	6.25	x	0.63	X	0.7	=	216.26	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	11	9.01	x	0.63	X	0.7	=	242.23	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	11	8.15	x	0.63	x	0.7	=	240.48	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	11	3.91	x	0.63	x	0.7	_ =	231.85	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	10	4.39	x	0.63	X	0.7		212.47	(77)
Southeast _{0.9x}	0.77	×	6.6	66	x	92	2.85	x	0.63	X	0.7	=	188.99	(77)
Southeast _{0.9x}	0.77	×	6.6	36	x	69	9.27	x	0.63	x	0.7	=	140.99	(77)
Southeast _{0.9x}	0.77	×	6.6	36	x	44	1.07	x	0.63	X	0.7	=	89.7	(77)
Southeast _{0.9x}	0.77	×	6.6	36	x [31	1.49	x	0.63	X	0.7		64.09	(77)
Solar gains in		$\overline{}$				- o- T		r `	= Sum(74)m	- ` ` ` 			7	(02)
(83)m= 106.96		92.15 Solar	409.41	501.86		7.27	490.78	418	.89 332.29	220.7	6 130.05	90.28		(83)
Total gains – i (84)m= 478.76		50.61	749.4	823.24	·	0.57	782.24	715	.72 638.52	545.6	5 476.39	452.56	1	(84)
` '						J.51	702.24	713	.72 030.32	343.0	3 470.39	432.30		(04)
7. Mean inter			,			_			- (2.6)					_
Temperature	Ū	٠.			•			ole 9,	Th1 (°C)				21	(85)
Utilisation fac		$\overline{}$			Ť					Τ_			1	
Jan		Mar	Apr	May	+	un	Jul	 	ug Sep	Oc	+	Dec	1	(06)
(86)m= 0.99).97	0.92	0.79		61	0.45	0.5		0.95	0.99	1]	(86)
Mean interna					_	i				1			7	
(87)m= 19.67	19.86 20	0.17	20.55	20.83	20	.96	20.99	20.	99 20.89	20.5	20.02	19.64]	(87)
Temperature	during heat	ting p	eriods ir	rest of	dwe	elling	from Ta	ble 9	9, Th2 (°C)	_			-	
(88)m= 19.83	19.83	9.83	19.84	19.84	19	.85	19.85	19.	85 19.85	19.8	19.84	19.83		(88)
Utilisation fac	ctor for gains	s for r	est of d	welling,	h2,n	n (se	e Table	9a)					_	
(89)m= 0.99	0.99 0).96	0.89	0.73	0.	51	0.34	0.3	9 0.68	0.93	0.99	0.99		(89)
Mean interna	l temperatu	re in t	he rest	of dwell	ing 7	Γ2 (fo	llow ste	ps 3	to 7 in Tab	ole 9c)	-	-		
(90)m= 18.09	· · ·	8.8	19.33	19.69	T -	.83	19.85	19.		19.3	18.6	18.04]	(90)
		!								fLA = Li	ving area ÷ (4) =	0.55	(91)
Mean interna	l temperatu	re (fo	r the wh	ole dwe	llina) = fl	Δ χ Τ1	+ (1	_ fl Δ\ ∵ Τα)				
(92)m= 18.97	 	9.56	20.01	20.32		.46	20.48	20.	<u> </u>	19.9	7 19.39	18.93	1	(92)
Apply adjustr				l	<u> </u>							I	1	, ,
				•				,		•				

_								,			1		ı	
	18.97	19.2	19.56	20.01	20.32	20.46	20.48	20.48	20.39	19.97	19.39	18.93		(93)
			uirement											
			ernal ter or gains	•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisati			ains, hm	•	iviay	Juli	Jui	l Aug	Сер	Oct	1407	Dec		
(94)m=	0.99	0.98	0.96	0.89	0.76	0.56	0.4	0.46	0.73	0.93	0.98	0.99		(94)
		hmGm .	, W = (94	1)m x (84	L 4)m	<u> </u>	<u> </u>							
_	474.65	552.88	624.02	669.63	623.8	463.18	315.93	329.16	463.88	507.92	468.39	449.48		(95)
ے Monthly	y avera	ige exte	rnal tem	perature	from Ta	able 8	<u> </u>		!			ļ	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 lo	ss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			l	
(97)m= 1	234.19	1200.48	1094.37	921.84	714.39	481.23	319.01	334.63	518.48	776.31	1021.87	1229.41		(97)
Space	heating	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	565.1	435.19	349.94	181.59	67.4	0	0	0	0	199.69	398.51	580.26		
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2777.66	(98)
Space	heating	g require	ement in	kWh/m²	/year								43.54	(99)
9a. Ener	rav rea	uiremer	nts — Indi	vidual h	eating s	vstems i	ncluding	ı micro-C	:HP)					
Space	•		ito iridi	vidual II	cating 5	y Storris 1	nordanig	TITIOIO C)					
•		_	nt from se	econdar	y/supple	mentary	system						0	(201)
	•		at from m			·	•	(202) = 1	- (201) =				1	(202)
	•		ng from	-	• •			(204) = (2)	02) × [1 –	(203)] =			1	(204)
			_	-				(201) – (2	02) X [1	(200)] -				╡`
	•	•	ace heati				0.4						93.5	(206)
Efficien	ncy of s	econda	ry/supple	ementar	y heating	g systen	า, % 				1		0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
· -	i	<u> </u>	ement (c		· · · · · · · ·	<u> </u>	ı						ı	
L	565.1	435.19	349.94	181.59	67.4	0	0	0	0	199.69	398.51	580.26		
(211)m =	= {[(98)	m x (20	4)] } x 1	00 ÷ (20)6)	•	•						•	(211)
	604.38	465.44	374.27	194.21	72.08	0	0	0	0	213.57	426.21	620.6		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	Į=	2970.76	(211)
Space	heating	g fuel (s	econdar	y), kWh/	month									
= {[(98)n	n x (20	1)] } x 1	00 ÷ (20	8)		1	1	,	1		,	ı	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}	,=	0	(215)
Water h	_													
Output f						400.0	100.44	145.50	45.07	100.50	174.44	400.05	1	
	187.56	165.5	174.24	156.79	154.09	138.3	133.41	145.58	145.07	162.56	171.14	183.25		7(040)
Efficienc	- -							l			T		79.8	(216)
` ' L	87.57	87.28	86.64	85.21	82.78	79.8	79.8	79.8	79.8	85.36	87	87.68		(217)
Fuel for (219)m :		•												
(219)m = 2		189.63	201.12	184.02	186.14	173.31	167.19	182.43	181.79	190.43	196.72	209		
· ' L						I	I		l = Sum(2	19a) ₁₁₂ =	!	I .	2275.96	(219)
Annual	totals										Wh/year	•	kWh/year	」 `
Space h		fuel use	ed, main	system	1					••	. ,		2970.76	7
														_

					_
Water heating fuel used				2275.96	
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 (23	0a)(230g) =		75	(231)
Electricity for lighting				287.21	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	641.69	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	491.61	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1133.29	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	149.06	(268)
Total CO2, kg/year	su	m of (265)(271) =		1321.28	(272)

TER =

(273)

30.48



APPENDIX C BRUKL REPORT – "BE LEAN" STAGE

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Tottenham Mews - Office (Lean)

As designed

Date: Wed Nov 04 12:30:57 2020

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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	26
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	26
Building CO ₂ emission rate (BER), kgCO ₂ /m².annum	19.7
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	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	BF000009:Surf[0]
Floor	0.25	0.12	0.12	BF000009:Surf[4]
Roof	0.25	0.18	0.18	BF000009:Surf[5]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	GF00000A:Surf[1]
Personnel doors	2.2	2.2	2.2	GF00000A:Surf[5]
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)]

 $U_{a\text{-}Cale}$ = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Cale} = 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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0.91	4	0	0	0.8		
Standard value	0.91*	2.6	N/A	N/A	0.5		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							
* Standard shown is for any single bailer systems <= 2 MM/ output. For single bailer systems >2 MM/ or multi-bailer systems (output) limiting							

^{*} Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- Electric Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	0.91	-	0.2	0	-		
Standard value	N/A	N/A	N/A	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							

1- DHW based on Multipoint 80V

	Water heating efficiency	Storage loss factor [kWh/litre per day]				
This building	0.91	0.01				
Standard value 0.9* N/A						
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.						

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
ļ	Zonal extract system where the fan is remote from the zone with grease filter

Zone name ID of system type		SFP [W/(I/s)]						UD - CC - :				
		Α	A В	С	D	E	E F	G	Н	1	HR efficiency	
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BF - Office		-	-	-	1.2	-	-	-	-	-	9	N/A
GF - Office WC		0.5	-	-	-	-	-	-	-	-	-	N/A
GF - Office		-	-	-	1.2	-	-	-	-	-	-	N/A
BF - WC		0.5	-	-	-	-	-	-	-	-	-	N/A
BF - Shower		0.5	-	-	-	-	-	-	-	-	_	N/A

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BF - Office	100	-	-	1120

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
GF - Cycle Store	100	÷	-	10
GF - Office WC	-	100	-	27
GF - Office	100	-	-	447
BF - WC	-	100	-	31
BF - Shower	-	100	-	17

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?
BF - Office	N/A	N/A
GF - Office	NO (-86.7%)	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?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	278.5	278.5
External area [m²]	458.5	458.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	106.2	153.25
Average U-value [W/m²K]	0.23	0.33
Alpha value* [%]	10.03	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	7.22	10.91
Cooling	2.87	4.74
Auxiliary	4.39	2.26
Lighting	14.13	25.89
Hot water	33.68	32.5
Equipment*	39.56	39.56
TOTAL**	62.3	76.3

^{*} 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/m²]	61.22	98.57
Primary energy* [kWh/m²]	113.94	151.42
Total emissions [kg/m²]	19.7	26

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

Н	IVAC Sys	tems Per	formanc	е						
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool 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	21	42.1	6.5	3.1	4.5	0.89	3.74	0.91	5
	Notional	32	70.7	10.3	5.2	2.1	0.86	3.79		
[ST] Other loca	al room hea	ter - unfanr	ed, [HS] Ro	om heater	, [HFT] Natu	ıral Gas, [C	FT] Electric	ity	
	Actual	59.1	0	21.4	0	5.1	0.77	0	0.91	0
	Notional	79.8	0	25.7	0	6.1	0.86	0		
[ST	[ST] No Heating or Cooling									
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0		

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-Typ}	U i₋Min	Surface where the minimum value occurs*
Wall	0.23	0.2	BF000009:Surf[0]
Floor	0.2	0.12	BF000009:Surf[4]
Roof	0.15	0.18	BF000009:Surf[5]
Windows, roof windows, and rooflights	1.5	1.4	GF00000A:Surf[1]
Personnel doors	1.5	2.2	GF00000A:Surf[5]
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
Diese = Typical individual element H-values BM//m²K)]	•	U _{sMo} = Minimum individual element U-values (W/(m²K))

U_{FTyp} = Typical 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

 $U_{i\text{-Min}}$ = Minimum individual element U-values [W/(m²K)]



APPENDIX D BRUKL REPORT – "BE GREEN" STAGE

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Tottenham Mews - Office (Green)

As designed

Date: Wed Nov 04 12:24:28 2020

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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	29.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	29.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	27.7
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	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	BF000009:Surf[0]
Floor	0.25	0.12	0.12	BF000009:Surf[4]
Roof	0.25	0.18	0.18	BF000009:Surf[5]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	GF00000A:Surf[1]
Personnel doors	2.2	2.2	2.2	GF00000A:Surf[5]
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_{e-Limit} = Limiting area-weighted average U-values [W/(m²K)]

 $U_{a\text{-}Cale}$ = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Cale} = 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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	3.5	4	0	0	0.8
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for thi	is HVAC syster	n YES
* Standard shown is f	for all types >12 kW output.	except absorption and gas	s engine heat pumps. For t	vpes <=12 kW outpu	ut, refer to EN 14825

^{*} 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.

2- Electric Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	1	-	0.2	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for thi	s HVAC syster	n YES

1- DHW based on Multipoint 80V

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
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
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name			SFP [W/(I/s)]						UD officional			
	ID of system type	Α	В	С	D	E	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
BF - Office		-	-	-	1.2	-	-	-	-	-	-	N/A
GF - Office WC		0.5	-	-	-	-	-	-	-	-	-	N/A
GF - Office		-	-	-	1.2	-	-	-	-	-	-	N/A
BF - WC		0.5	-	-	-	-	-	-	-	-	-	N/A
BF - Shower		0.5	-	-	-	-	-	-	-	-	-	N/A

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	
BF - Office	100	-	-	1120

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	
GF - Cycle Store	100	÷	-	10
GF - Office WC	-	100	-	27
GF - Office	100	-	-	447
BF - WC	-	100	-	31
BF - Shower	-	100	-	17

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?
BF - Office	N/A	N/A
GF - Office	NO (-86.7%)	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?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	278.5	278.5
External area [m²]	458.5	458.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	106.2	153.25
Average U-value [W/m²K]	0.23	0.33
Alpha value* [%]	10.03	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	2.67	4.65
Cooling	2.87	4.74
Auxiliary	4.39	2.26
Lighting	14.13	25.89
Hot water	30.65	32.5
Equipment*	39.56	39.56
TOTAL**	54.72	70.04

^{*} 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/m²]	61.22	98.57
Primary energy* [kWh/m²]	163.79	145.35
Total emissions [kg/m²]	27.7	29.1

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable

Н	IVAC Sys	tems Pei	formanc	е						
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or m	u <mark>lti-</mark> split sy	stem, [HS]	Heat pump	(electric): a	ir source, [HFT] Electr	icity, [CFT]	Electricity	
	Actual	21	42.1	1.7	3.1	4.5	3.43	3.74	3.5	5
	Notional	32	70.7	3.5	5.2	2.1	2.56	3.79		
[ST] Other loca	al room hea	ter - unfanr	ned, [HS] Di	rect or stor	age electric	c heater, [H	FT] Electric	ity, [CFT] E	lectricity
	Actual	59.1	0	19.5	0	5.1	0.84	0	1	0
	Notional	79.8	0	25.7	0	6.1	0.86	0		
[ST] No Heatin	g or Coolin	g							
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	_	

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-Typ}	U i₋Min	Surface where the minimum value occurs*
Wall	0.23	0.2	BF000009:Surf[0]
Floor	0.2	0.12	BF000009:Surf[4]
Roof	0.15	0.18	BF000009:Surf[5]
Windows, roof windows, and rooflights	1.5	1.4	GF00000A:Surf[1]
Personnel doors	1.5	2.2	GF00000A:Surf[5]
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
Diese = Typical individual element H-values BM//m²K)]	•	U _{sMo} = Minimum individual element U-values (W/(m²K))

U_{FTyp} = Typical 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

 $U_{i\text{-Min}}$ = Minimum individual element U-values [W/(m²K)]



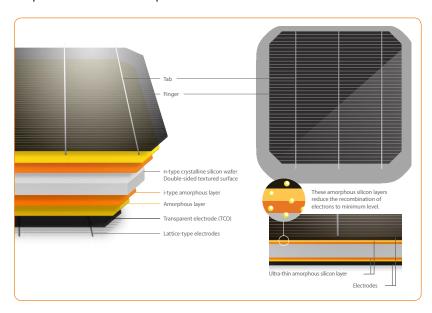
APPENDIX E PV DATA SHEET



Panasonic

Photovoltaic module HIT® N300

Panasonic's unique heterojunction technology uses ultra-thin amorphous silicon layers. These thin dual layers reduce losses, resulting in higher energy output than conventional panels.



Our slim Panasonic HIT® N300 features a high module efficiency of 19.5%, an industry leading temperature coefficient of -0.258% / C and a sleek design. Powerful and efficient, designed to get the most out of your roof!



Our competitive advantages



High Performance at High Temperatures As temperature increases, HIT° continues to perform at high levels due to the industry leading temperature coefficient of -0.258% /°C. No other module even comes close to our temperature characteristics. That means more energy throughout the day and particularly in summer.



25 Year Product and Performance Guarantee**
Industry leading 25 year product workmanship
and performance guarantee is backed by a
century old company - Panasonic.
Power output is guaranteed to 86.2% after 25 years.



Quality and Reliability

Panasonic's vertical integration, over 20 years of experience manufacturing HIT° and 20 internal tests 3-times beyond those mandated by current standards provide extreme quality assurance.



Higher Efficiency of 19.5% and compact size Enables higher power output and greater energy yields. HIT° provides maximum production for your limited roof space.



Low Degradation

HIT "N-type" cells result in extremely Low Light Induced Degradation (LID) and zero Potential Induced Degradation (PID) which supports reliability and longevity. This technology reduces annual degradation, guaranteeing more power for the long haul.



Unique water drainage

The water drainage system gives rain, water and snow melt a place to go, reducing water stains and soiling on the panel.

Less dirt on the panel means more sunlight getting through to generate power.



Panasonic

Photovoltaic module HIT® N300

Model .	VBHN300SJ46
Maximum Power (Pmax) ¹	300 W
Maximum Power Voltage (Vpm)	53.1 V
Maximum Power Current (Ipm)	5.65 A
Open Circuit Voltage (Voc)	63.8 V
Short Circuit Current (Isc)	6.04 A
Max. Power at NOCT (Normal Operating Conditions: air mass 1.5; irradiance = 800W/m²; air temperature 20°C; wind speed 1 m/s)	229.5 W
Temperature Coefficient (Pmax)	-0.258 %/°C
Temperature Coefficient (Voc)	-0.235 %/°C
Temperature Coefficient (Isc)	0.055 %/°C
NOCT	44.0 ℃
Module Efficiency	19.5 %
Maximum System Voltage	1000 V
Series Fuse Rating	15 A
Power Tolerance (-/+)	+10%/0%*

MECHANICAL SPECIFICATIONS VBHN300SJ46 Internal Bypass Diodes 4 Bypass Diodes Module Area 1.54 m² Weight 18 kg Dimensions LxWxH 1053 mm x 1463 mm x 35 mm Cable Length +Male/-Female 960 mm / 960 mm Cable Size / Type No. 12 AWG / PV Cable Connector Type Static Wind / Snow Load 2400 Pa Pallet Dimensions LxWxH 1491mm x 1071mm x 1590mm Quantity per Pallet / Pallet Weight 40 pcs. (760 kg) Quantity per 40' Container 600 pcs.

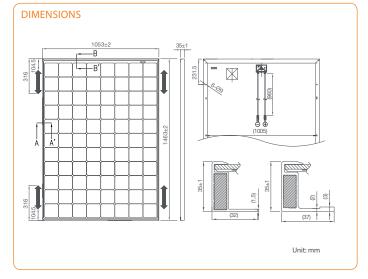
OPERATING CONDITIONS & SA	AFETY RATINGS
Model	VBHN300SJ46
Operating Temperature	-40°C to 85°C
Safety & Rating Certifications	IEC61215, IEC61730-1, IEC1730-2
Fire Classification	Class Uno
Limited Guarantee	25** years workmanship and power output (linear)***

NOTE: Standard Test Conditions: Air mass 1.5; irradiance = 1000W/m²; cell temp. 25°C

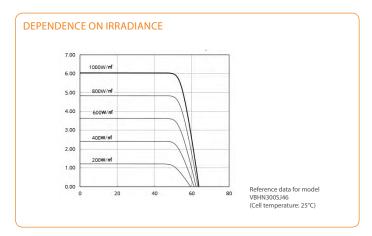
- ${}^{*}\operatorname{Maximum}\operatorname{power}\operatorname{at}\operatorname{delivery}.\operatorname{For}\operatorname{guarantee}\operatorname{conditions},\operatorname{please}\operatorname{check}\operatorname{our}\operatorname{guarantee}\operatorname{document}.$
- ** Registration necessary on www.eu-solar.panasonic.net, otherwise 15 years apply based on guarantee document.
- *** 1st year 97 %, from 2nd year -0.45 %/year, in 25th year 86.2%.
- ¹ STC: Cell temp. 25°C, AM1.5, 1000W/m²

NOTE: Specifications and information above may change without notice.

Company of the content of the con







 \triangle CAUTION! Please read the installation manual carefully before using the products.

Used electrical and electronic products must not be mixed with general household waste. For proper treatment, recovery and recycling of old products, please take them to applicable collection points in accordance with your national legislation.





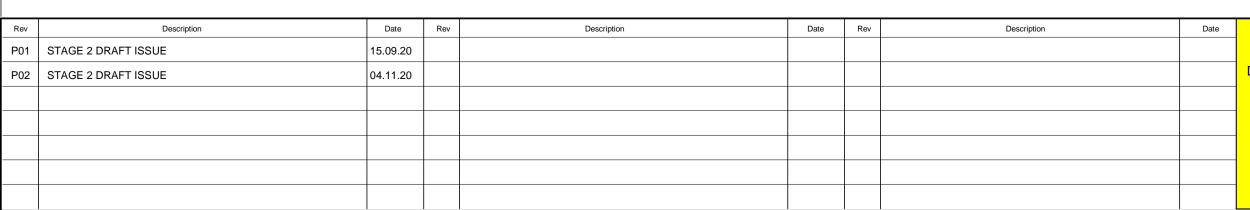


APPENDIX F ASHP LAYOUT



No. **DESCRIPTION**

- 1 4 NO. HOT WATER HEAT PUMPS (AIR SOURCE)
- 2 HOT WATER CIRCULATING PUMPS
- 3 BUFFER VESSEL
- 4 PRESSURISATION UNIT
- 5 2 NO. VRF CONDENSER UNITS FOR B1 OFFICE
- 6 MECHANICAL, PUBLIC HEALTH AND FIRE SPRINKLER RISER
- 7 ELECTRICAL, COMMUNICATIONS AND FIRE DETECTION RISER
- 8 REFER TO LEVEL 3 COMBINED SERVICES LAYOUT FOR TYPICAL SERVICES CONNECTIONS TO APARTMENTS
- 9 LEVEL 5 TERRACE TO BE BLUE ROOF. TWO BLUE ROOF OUTLETS AND TWO OVERFLOW ROOF OUTLETS ARE PROPOSED FOR RAINWATER DRAINAGE AND ATTENUATION. REFER TO CIVIL ENGINEER'S AND BLUE ROOF SPECIALIST'S DOCUMENTS FOR ATTENUATION REQUIREMENTS AND DETAILS
- 10 ACCESS ZONE
- 11 INDICATIVE LOCATION OF OVERFLOW ROOF OUTLET, AS COORDINATED WITH ARCHITECT
- 12 INDICATIVE LOCATION OF BLUE ROOF OUTLET, AS COORDINATED WITH ARCHITECT
- 13 DRY RISER MAIN
- 14 FIRE RATED SMOKE EXTRACT DUCTWORK RISER MINIMUM 0.6SQM CROSS SECTIONAL AREA REQUIRED (APPROX DUCT SIZE 750mm X 1100mm). EACH OFFICE FLOOR TO HAVE A SMOKE EXTRACT GRILLE AND MOTORISED FIRE AND SMOKE DAMPER CONNECTED TO THE SMOKE EXTRACT SHAFT, SERVING THE PROTECTED LOBBY
- 15 THE LOBBY ON LEVEL 5 IS TO BE VENTILATED VIA AN ACTUATED DOOR TO THE EXTERNAL LEVEL 5 PLANT ENCLOSURE



10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 When reproduced at correct scale this line measures 150mm

CDM NOTES

DURING THE DESIGN PHASE, CONSIDERATION HAS BEEN GIVEN TO SITE SPECIFIC HAZARD IDENTIFICATION. A SCHEDULE OF CDM RISK ITEMS IS INCLUDED WITHIN THESE DOCUMENTS HOWEVER IT SHOULD BE NOTED THAT ONLY SIGNIFICANT AND UNUSUAL RISKS HAVE BEEN IDENTIFIED. THE CONTRACTOR MUST CARRY OUT THEIR OWN RISK ASSESSMENT AS OTHER UNIDENTIFIED RISKS MAY EXIST. WHERE RISK(S) HAVE BEEN IDENTIFIED ON THIS DRAWING PLEASE REFER TO THE CDM SCHEDULE LOCATED ON THE LEGEND SHEET FOR DETAILS



AM: 04 NOV 2020

GS: 04 NOV 2020 Verification Of Latest Amendment



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NDY Consulting Ltd

A registered company in England & Wales

Company Registration No. 3890617

LEVEL 05 This drawing is diagrammatic and shows the general arrangement of equipment. Any information involving measurement of the works shall be taken from architectural and structural drawings, workshop drawings by others and conditions at the site. The works shall comply with the contract conditions and Statutory Regulations. Copyright © NDY Management Pty Limited.

TOTTENHAM MEWS 14-19 Tottenham Mews, London

COMBINED SERVICES **RISER & PLANT LAYOUT**

Drawing No. 1419TM-NDY-XX-05-DR-N-5001 1 : 100 @ A1 | ICE | GE | Project No. | Project Commencement | P02

U14072-001 JUL. 2020



APPENDIX G GLA REPORTING SPREADSHEET

••	•					units, the area pe	r unit, the number	of units, the base	eline energy consu	umption figures, t	the TER and the 1	TFEE.			SAP 2012 CO₂ PERF	ORMANCE					SAP 10.0	CO ₂ PERFORMANCE				
DMESTIC	CENERGY	CONSUM	IPTION AN	D CO ₂ ANA	LYSIS ON CHECK		REGULATED EN	VERGY CONSUM	PTION PER UNIT	(kWh p.a.) - TER	WORKSHEET			REGULA	TED CO2 EMISSIONS I	PER UNIT (kgCO- p.a.)					REGULATED O	CO2 EMISSIONS PER U	JNIT			Fabric E Efficie
it identifier (e.g. plot number, velling type etc.)	floor area		Total area represented by model (m²)		TER Worksheet TER 2012 (kgCO ₂ / m ²)	Space Heating	Fuel type Space Heating	Domestic Hot		Lighting	Auxiliary	Cooling	Space Heating			Auxiliary	Cooling	2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating	Domestic Hot Water		Auxiliary	Cooling	SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)	Calculated TER SAP 10.0 (kgCO ₂ / m ²)	(FEE Target F Ener Efficie (TFE (kWh/
	TER Worksheet				TER Worksheet (Row 273)	TER Worksheet (Row 211)		TER Worksheet (Row 219)	t	TER Worksheet (Row 232)	TER Worksheet (Row 231)	N/A														
- 284P - 385P	85.3 91.6	2 4	162.3 361.2	18.5 15.5	18.5 15.5	3637.13 2946.67	Natural Gas Natural Gas	2473.92 2530.95	Natural Gas Natural Gas	421.71 385.9	75 75		786 636	534 547	219 200	39 39		1,578 1,422	764 619	520 531	98 90	17 17		1,399 1,258	16.4 13.7	
- 284P - 284P - 385P - 182P - 182P - 283P - 283P	83.2 76 102.3 81.5 55.3 64.7 63.8	4 6 3 1 1 1	289.8 361.3 285.9 81.5 55.3 64.7 63.8	15.3 16.3 14.6 17.9 19.7 20.3 20.8	15.3 16.3 14.6 17.9 19.7 20.4 20.8	2336.42 2272.37 3089.81 3191.38 2065.22 2928.63 2990.28	Natural Gas	2485.38 2422.05 2578.77 2452.74 2184.1 2287.57 2275.62	Natural Gas Natural Gas Natural Gas Natural Gas Natural Gas Natural Gas Natural Gas	369.33 359.22 435.56 380.45 253.42 290.68 287.21	75 75 75 75 75 75 75		505 491 667 689 446 633 646	537 523 557 530 472 494 492	192 186 226 197 132 151 149	39 39 39 39 39 39		1,272 1,239 1,489 1,456 1,088 1,316 1,325	491 477 649 670 434 615 628	522 509 542 515 459 480 478	86 84 101 89 59 68 67	17 17 17 17 17 17		1,116 1,087 1,309 1,291 969 1,181 1,190	13.4 14.3 12.8 15.8 17.5 18.2 18.7	
N-DOME	1,898 ESTIC ENE	23 ERGY COI	1,726 NSUMPTIO		ANALYSIS	57,291	N/A	51,266	N/A	7,747	1,566	0	12,375	11,073	4,021	813	0	28,282	12,031	10,766	1,805	365	0	24,967	14.5	43.1
ding Use	Model Area (m²)	Number of units	Total area represented by model	VALIDATI Calculated TER 2012	DN CHECK BRUKL TER 2012	Space Heating (kWh/m² p.a.)	Fuel type Space Heating	Domestic Hot Water		Lighting	Auxiliary (kWh/m² p.a.)	Cooling	REGULATED ENER Natural Gas	GY CONSUMPTION Grid Electricity	BY FUEL TYPE (kWh/m	² p.a.) TER - SOURCE	E: BRUKL.INP or 1	2012 CO ₂ emissions	REGULAT Natural Gas	Grid Electricity	Unregulated Grid Electricity	E (kWh/m² p.a.) - TER		REGULATED C SAP10.0 CO ₂ emissions	O ₂ EMISSIONS BRUKL TER SAP10.0	
	278.5	1	(m²) 270.2	(kgCO ₂ / m ²) 26.0	(kgCO ₂ / m ²) 26.0	10.9143	Natural Gas	(kWh/m² p.a.) 32.4952	Water Natural Gas	25.8943	2.25792	4.7421	0.216 kgCO ₃ /kWh 43	0.519 kgCO ₃ /kWh 32	0.519 kgCO ₃ /kWh 40			(kgCO ₂ p.a.)	0.210 kgCO ₂ /kWh 43	0.233 kgCO ₃ /kWh 32		_	-	(kgCO ₂ p.a.) 4,620	(kgCO ₂ / m ²)	-
	279	1	270	25.2	-	2,949	N/A	8,780	N/A	6,997	610	1,281	11,729	8,665	10,690	N/A	N/A	7,031	11,729	8,665	10,690	N/A	N/A	4,482	16.6	
/IDE ENE	279 ERGY CONSUM			25.2	·	2,949	N/A	8,780	N/A	6,997	610	1,281	11,729	8,665	10,690	N/A	N/A		11,729	8,665	10,690	N/A				
	ERGY CONSUM	MPTION AND (CO₂ ANALYSIS	Calculated	·	2,949	N/A	REGULATE	N/A D ENERGY CONS		610	1,281	11,729	8,665	10,690	N/A	N/A	REGULATED CO ₂ EMISSIONS	11,729	8,665	10,690	N/A	F	REGULATED CO ₂	EMISSIONS PER	•
IDE ENE	ERGY CONSUM		CO₂ ANALYSIS		·	2,949 Space Heating (kWh p.a.)	N/A	•			610 Auxiliary (kWh p.a.)	1,281 Cooling (kWh p.a.)	11,729	8,665	10,690	N/A	N/A	REGULATED CO ₂	11,729	8,665	10,690	N/A	F	REGULATED CO ₂ UN — SAP 10.0 CO ₂	EMISSIONS PER	

						an' energy consur	mption figures, the	'be lean' DER, the DF	EE and the regulat	ed energy deman	d of the 'be lean	'scenario.					\$	AP 2012 CO ₂ PEF	RFORMANCE					SAP	P 10.0 CO ₂ PERFORM	MANCE				FEES
DOMESTIC	ENERGY	CONSUMI	PTION AN		LYSIS ION CHECK			REGULATED ENER	SY CONSUMPTION	PER UNIT (kWh p	o.a.) - 'BE LEAN'	SAP DER WORKS	SHEET				REGULATE	D CO ₂ EMISSION	S PER UNIT (kgCO ₂ p.a	a.)				REGULA	TED CO2 EMISSION	S PER UNIT				Fabric Energy Efficiency
Unit identifier (e.g. plot number, dwelling type	Model total floor area (m²)	Number of units	Total area represented by model	DER 2012	DER Worksheet DER 2012 (kgCO ₂ / m ²)	t Space Heating	Fuel type Space Heating	Domestic Hot Water (Heat Source 1)	Fuel type Domestic Hot Water	Secondary Heating system	Fuel type Space Heating	Lighting	Auxiliary	Cooling	-	Space Heating CO ₂ emissions (kgCO ₂ p.a.)	Domestic Hot Water CO ₂ emissions	Lighting CO ₂ emissions		poling 2012 missions	2 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating CO ₂ emissions (kgCO ₂ p.a.)	Domestic Hot Water CO ₂ emissions (kgCO ₂ p.a.)	Lighting CO ₂ emissions (kgCO ₂ p.a.)	Auxiliary CO ₂ emissions C (kgCO ₂ p.a.)	O ₂ emissions	Unregulated (kgCO ₂ p.a.)	SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)		(FEE) Dwelling Fabric Energy Efficiency
etc.)			(m²)	(,												(1922)	(kgCO ₂ p.a.)	(-927)	(182-22)	,		((-9277	(627)	(**************************************	(()	(,	(DFEE) (kWh/m²)
					DER Sheet (Row 384)	DER Sheet [(Row 307a) ÷ (Row 367a x	Select fuel type	DER Sheet [Row 310b ÷ (Row 367b x 0.01)]	Select fuel type	DER Sheet [Row 309]	Select fuel type	DER Sheet Row 332	DER Sheet (Row 313 + 331)	DER Sheet Row 315																
0_02 - 2B4P 2_01 - 3B5P 2_02 - 2B4P	85.3 91.6 83.2	2 4 4	162.3 361.2 289.8	18.3 15.1 14.2	18.3 15.1 14.2	0.01)1 3057.731844 2155.631285 1479.083799	Natural Gas Natural Gas Natural Gas	2648.581006 2688.569832 2633.240223	Natural Gas Natural Gas Natural Gas			409.9 381.27 361.13	216.5315 269.1656 198.1953			660 466 319	572 581 569	213 198 187	112 140 103		1,558 1,384 1,179	642 453 311	556 565 553	96 89 84	50 63 46		655 687 644	1,344 1,169 994	15.8 12.8 11.9	48 37.5 32.7
2_03 - 2B4P 2_04 - 3B5P 4_05 - 1B2P	76 102.3 81.5	6 3 1	361.3 285.9 81.5	15.4 14.0 20.0	15.4 14.0 20.0 21.2	1557.709497 2152.111732 3518.558659	Natural Gas Natural Gas Natural Gas	2572.648045 2738.03352 2620.055866	Natural Gas Natural Gas Natural Gas			349.1 423.94 369.64	184.3867 295.9568 213.0306			336 465 760 459	569 556 591 566 505 530	181 220 192	96 154 111		1,169 1,430 1,628	311 327 452 739 446	553 540 575 550 491	81 99 86	43 69 50		644 603 735 634 467	994 992 1,195 1,425 1,030	13.0 11.7 17.5	32.7 35.4 35.1 54.4 51.5 56.9 61.5
5_01 - 1B2P 5_02 - 2B3P 5_03 - 2B3P	55.3 64.7 63.8	1 1 1	55.3 64.7 63.8	21.2 21.7 23.0	21.2 21.7 23.0	2123.921788 2930.681564 3250.73743	Natural Gas Natural Gas Natural Gas	2337.47486 2453.564246 2442.972067	Natural Gas Natural Gas Natural Gas			253.42 290.68 287.21	147.1995 173.699 174.7187			459 633 702	505 530 528	132 151 149	76 90 91		1,172 1,404 1,470	446 615 683	491 515 513	59 68 67	34 40 41		467 531 525	1,030 1,239 1,303	18.6 19.1 20.4	51.5 56.9 61.5
NON-DOME	1,898 STIC ENE	23 RGY CON	1,726 ISUMPTIO	16.1 ON AND CO:	ANALYSIS	44,714	N/A	54,549	N/A	0	N/A	7,587	4,576	0	N/A	9,658	11,783	3,937	2,375	0	27,753	9,390	11,455	1,768	1,066	0	13,273	23,679	13.7	39.31
			T-4-1	VALIDAT	ION CHECK		REGUI	LATED ENERGY COM	SUMPTION BY EN	D USE (kWh/m² p.	a.) 'BE LEAN' B	ER - SOURCE: BR	RUKL OUTPUT		REGULATED ENE	RGY CONSUMPTION	BY FUEL TYPE (kW	n/m² p.a.) 'BE LE	AN' BER - SOURCE: E	RUKL.INP or *S	SIM.CSV FILE			REGULA	TED CO2 EMISSION	S PER UNIT				
Building Use	Model Area (m²)	Number of units	Total area represented by model (m²)	Calculated	BRUKL	Space Heating (kWh/m² p.a.)	Fuel type Space Heating		Fuel type Domestic Hot			Lighting (kWh/m² p.a.)	Auxiliary (kWh/m² p.a.)	Cooling (kWh/m² p.a.)	Natural Gas	Grid Electricity	Equipment			2012	2 CO ₂ emissions	Natural Gas	Grid Electricity	Equipment				SAP 10.0 CO ₂	BRUKL	
				BER 2012 (kgCO ₂ / m ²)				(kWh/m² p.a.)	Water							0.519 kgCO ₂ /kWh	0.519 kgCO ₂ /kWh				(kgCO ₂ p.a.)		0.233 kgCO ₂ /kWh		 }_			emissions (kgCO ₂ p.a.)	BER SAP 10.0 (kgCO ₂ / m ²)	
Office	278.5	1	270.2	19.7	19.7	7.21756	Natural Gas	33.6815	Natural Gas			14.1339	4.39497	2.86795	41	21	40				5,476	41	21	40				3,746	13.4	
																														MIA
Sum SITE-WIDE	279 ENERGY (1 CONSUME	270 PTION AN	19.7 D CO2 ANA	LYSIS	1,950	N/A	9,101	N/A	N/A	N/A	3,819	1,188	775	11,051	5,637	10,690	N/A	N/A	N/A	5,312	11,051	5,637	10,690				3,634	13.4	
									REGULAT	ED ENERGY CON	SUMPTION										GULATED CO ₂ SSIONS							REGULATED	CO ₂ EMISSIONS	
Use	т	otal Area (m²	9	Calculated BER 2012 (kgCO ₂ / m ²)	-	Space Heating		Domestic Hot Water		Secondary Heating		Lighting	Auxiliary	Cooling						2012	2 CO ₂ emissions							SAP 10.0 CO ₂ emissions	Calculated BER SAP 10.0	NIA
		4 ***				(kWh p.a.)	MA	(kWh p.a.)	MA	System (kWh p.a.)	WP	(kWh p.a.)	(kWh p.a.)	(kWh p.a.)						9	(kgCO ₂ p.a.)							(kgCO₂ p.a.)	(kgCO ₂ / m ²)	
Sum		1,996		16.6	-	46,664		63,650		0		11,406	5,764	775							33,066							27,313	13.7	

The applicant should					lean' energy consun	nption figures and t	the 'be clean' DER.													SAP 2012 CO ₂ PERFO	RMANCE							SAP 10.0 CC	PERFORMANCE			
DOMESTIC EN	ERGY CO	NSUMPTION A		TALYSIS				REGIII A	ATED ENERGY CON	ISLIMPTION PER LI	INIT (kWh n a) - 'Ri	CLEAN' SAP DER	WORKSHEET						PEGIII ATE	ED CO ₂ EMISSIONS PE	P UNIT (knCO, n.a.)							REGULATED CO ₂ EMIS	SIONS PER LINIT (kgC	O. n.a.)		
Unit identifier (e.g. plot Mod	del total Num	Total area	Calculated	DER Workshee	et Space Heating	Fuel type	Domestic Hot	Fuel type	Space and		Total Electricity	Secondary	Fuel type	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Space Heating and	Electricity generated		Auxiliary	Cooling	2012 CO ₂ emissions	Space Heating	Domestic Hot Water	er Space Heating an	nd Electricity generate			oling SAP 10.0	CO ₂ Calculated
number, floo		inits by mode (m²)	DER 2012	DER 2012 (kgCO ₂ / m ²)	(Heat Source 1)	Space Heating	Water (Heat Source 1)	Domestic Hot	Domestic Hot Water from CHP		generated by CHP (-)	Heating system	Secondary Heating						DHW from CHP	by CHP				(kgCO ₂ p.a.)			DHW from CHP	by CHP			emissio (kgCO ₂ p	ns DER SAP 10.
				DER Sheet	DER Sheet	Select fuel type	DER Sheet		if applicable	if applicable Select fuel type	if applicable DER Sheet	DER Sheet	Select fuel type	DER Sheet	DER Sheet	DER Sheet			if applicable	if applicable							if applicable	if applicable				
1				(Row 384)	[Row 307b + (Row 367b x	Select fuel type	[Row 310b ÷ (Row 367b x	Select fuel type	((Row 307a + 310a) ÷	Select fuel type	[(Row 307a + 310a) × (Row 361	[Row 309]	Select fuel type	Row 332 (Row 313 + 331)	Row 315																
0_02 - 2B4P 8 2_01 - 3B5P 9	85.3 91.6	2 162.3 4 361.2	18.3 15.1	18.3 15.1	0.01)1 3057.731844 2155.631285	Natural Gas Natural Gas	0.01)1 2648.581006 2688.569832	Natural Gas Natural Gas	(Row 362 x 0.01)]		+ 36211			409.9 381.27	216.5315 269.1656		660 466	572 581			213 198	112 140		1,558 1,384	642 453	556 565			96 89	50 63	1,344 1,169	
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4_05 - 1B2P 8 5 01 - 1B2P 8	81.5 55.3 64.7	1 81.5 1 55.3 1 64.7	20.0 21.2	20.0 21.2 21.7	3518.558659 2123.921788 2930.681564	Natural Gas Natural Gas Natural Gas	2620.055866 2337.47486 2453.564246	Natural Gas Natural Gas Natural Gas						369.64 253.42 290.68	213.0306 147.1995 173.699		760 459	566 505			192 132	111 76		1,628 1,172 1,404	739 446	550 491			86 59 68	50 34	992 1,195 1,425 1,030 1,239 1,303	11.7 17.5 18.6 19.1
5_03 - 2B3P 6	63.8	1 63.8	23.0	23.0	3250.73743	Natural Gas	2453.564246 2442.972067	Natural Gas						287.21	174.7187		633 702	530 528			151 149	91		1,470	615 683	515 513			67	41	1,303	20.4
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NON-DOMESTI		23 1,726 Y CONSUMPT		O2 ANALYSIS		N/A	54,549	N/A	0	N/A	0	0	N/A	7,587	4,576	0	9,658	11,783	0	0	3,937	2,375	0	27,753	9,390	11,455	0	0	1,768	1,066	0 23,675	9 13.7
		Total area	VALIDA Calculated	TION CHECK BRUKL	Space Heating	Fuel type	Domestic Hot	Fuel type	NERGY CONSUMPT	ION BY END USE	(kWh/m² p.a.) 'BE C	LEAN' BER - SOUR	CE: BRUKL OUTP	Lighting	Auxiliary	Cooling	REG Natural Gas		ONSUMPTION BY FUEL Bespoke DH Factor			OURCE: BRUKLINF		2012 CO ₂ emissions	Natural Gas	Grid Electricity	RE Bespoke DH Fact	GULATED CO ₂ EMISSIC	NS PER UNIT		SAP 10.0	CO ₂ BRUKL
Building Use Mod	del Area Num (m²) ur	nber of represente	BER 2012	BER 2012 (kgCO ₂ / m ²)	(kWh/m² p.a.)	Space Heating	Water (kWh/m² p.a.)	Domestic Hot			generated by CHP			(kWh/m² p.a.)	(kWh/m² p.a.)	(kWh/m² p.a.)		,	•	by CHP (-)				(kgCO ₂ p.a.)				by CHP (-)			emissio (kgCO ₂ p	ns BER SAP10.0
		(m²)									(-)						0.216 kaCO ₂ /kWh	0.519 kaCO _a /kWh	0.000 kaCO _s /kWh	if applicable 0.519 kgCO ₂ /kWh	0,519 kgCO ₂ /kWh	-			0.210 kaCO ₃ /kWh	0.233 kaCO ₂ /kWh	0.000 kaCO ₂ /kW	if applicable h 0.233 kgCO _s /kWh	0.233 kaCO ₂ /kWh			
Office 2	278.5	1 270.2	19.7	19.7	7.21756	Natural Gas	33.6815	Natural Gas						14.1339	4.39497	2.86795	41	21			40			5,476	41	21			40		3,746	13.4
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Sum :	279	1 270	19.7		1,950	N/A	9,101	N/A		#1	0			3,819	1,188	775	11,051	5,637	0	0	10,690			5,312	11,051	5,637	0	0	10,690		3,634	13.4
Sum :			_	- IALYSIS	1,950	N/A	9,101	N/A	- T	REGULATED EN	0 IERGY CONSUMPT			3,819	1,188	775	11,051	5,637	0	0	10,690			REGULATED CO ₂	11,051	5,637	0	0	10,690		REGULA	ATED CO₂ EMISSIONS
	ERGY CON		Calculated BER 2012			N/A		N/A	Space and	REGULATED EN	IERGY CONSUMPT	ion					11,051	5,637	٠	0	10,690			REGULATED CO ₂ EMISSIONS	11,051	5,637	0	٠	10,690		REGULA	ATED CO2 EMISSIONS PER UNIT
SITE-WIDE ENE	ERGY CON	NSUMPTION A	AND CO2 AN		1,950 Space Heating (kWh p.a.)	N/A	9,101 Domestic Hot Water (kWh p.a.)	NA NA			IERGY CONSUMPT		40		1,188 Auxiliary (kWh p.a.)	Cooling (kWh p.a.)	11,051	5,637	•	0	10,690			REGULATED CO ₂	11,051	5,637	0	0	10,690		REGULA	ATED CO₂ EMISSIONS

The applicant should complete all the light blue cel			e green' energy consumpti	on figures and the 'be g	reen' DER.																	SAP 2012 CO ₂ PER	RFORMANCE									SAP 10.0 C	D ₂ PERFORMANCE				
DOMESTIC ENERGY CONSUMPTION A	VALIDA	TION CHECK						EGULATED ENERGY	CONSUMPTION PER	UNIT (kWh p.a.) - 1	BE GREEN' SAP DER	RWORKSHEET									REGULA	ATED CO, EMISSIONS	S PER UNIT (kaCO, a	pa)								REGULATED CO	D ₂ EMISSIONS PER U	NIT			
Unit identifier (e.g. plot number, dwelling type etc.) Unit identifier (e.g. plot number, dwelling type etc.) Model total number of represent units by model (m²)	Calculated DER 2012 (kgCO ₂ / m ²)	DER Worksheet DER 2012 (kgCO ₂ / m ²)	Space Heating Fig. (Heat Source 1) Space	el type Domestic e Heating Water (Heat Sour	Hot Fuel ty r Domesti rce 1) Wate		g Fuel type !) Space Heating	Domestic Hot Water (Heat source 2)	Fuel type Domestic Hot Water V		Fuel type CHP Tot	tal Electricity So enerated by Heat CHP (-)	econdary Fue ting system Secondary He.	al type Electrici ondary generated atting renewable		Auxiliary	Cooling	Space Heating	Domestic Hot Water	DHW from CHP	Electricity generated by CHP	Electricity generated by renewable	Lighting	Auxiliary	Cooling		2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating	Domestic Hot Water	DHW from CHP	generated by CHP	Electricity generated by renewable	Lighting	Auxiliary	Cooling	SAP 1 emis (kgCC	0.0 CO ₂ Calculated sions DER SAP 10.0 (kgCO ₂ / m ²)
0_02 - 2B4P 85.3 2 162.3	12.3	DER Sheet (Row 384)	(Row 307b + (Row 367b x	t fuel type DER Sh [Row 311 (Row 361 0 041) Electricity 948.19	eet Select fui b + 7b x 2 Grid Elec	(Row 307c +	Select fuel type 1)] Grid Electricity	[Row 310c + (Row 367c x 0.01)]	Select fuel type Grid Electricity	If applicable DER Sheet [(Row 307a + 310a) + (Down 362 v	if annilicable if it is	anniicable DER Sheet Di Row 307a + F 10a) × (Row 164 ± 26211	ER Sheet Select Row 309	if anolical fuel type DER She Row 33		346.6346	DER Sheet Row 315	568	492	if anniirable	if anniirable	if anniirable	213	112			1,049	255	221	if annlicable	if anniicable	481	96	50		4	71 5.5
\$28.2889 85.3 2 162.3 \$2.01.3889 91.6 4 30.5 \$2.02.2889 82.2 4 20.8 \$2.02.2889 82.2 4 20.8 \$2.02.289 82.2 4 20.8 \$2.02.289 82.2 5 20.8 \$2.02.289 82.5 7 82.5 \$2.02.289 83.5 7 83.5 \$2.02.289 83.8 7 83.8 \$2.02.289 83.8 7 83.8	8 6 6 1 8 8 6 1 1 8 8 6 1 1 1 8 1 1 1 1	12.3 9.6 8.7 8.8 8.8 10.8 11.8 11.8 11.8 11.8 11.8 1	posars 3 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	Between American Company of the Comp	To x 3	nother with the second								64735 64737 64737 64737 64737 64734 64734 64734 64734 64734 64737 64737 64737	88.27 36.13 340.1 200.4 200.6 200.6 200.7 20	200.566 191.593 194.593 194.593 194.594 195.594 197.1955 197.444		401 275 280 600 600 3966 599	500 488 559 559 444 454 456 454				1988 1989 1989 1989 1989 1989 1989 1989	1400 1500 1500 1500 1500 1500 1500 1500			15,049 777 777 777 786 787 15,02 15,02 15,02 15,04 15,04 15,04	100 100 100 100 100 100 100 100 100 100	224 225 226 226 227 228 229 229 229 224			-62 -62 -63 -64 -64 -64 -64 -64 -64 -64 -64 -64 -64	50 to 1 to	63 44 44 45 45 45 45 45 45 45 45 45 45 45			14 43 43 44 45 44 46 46 46 46 46 47 47 47 47 47 47 47 47 47 47 47 47 47
Sum 1,898 23 1,726 NON-DOMESTIC ENERGY CONSUMPT Total are Total are Use Area par Number of Total unit by mode units by mode of the production of the producti	TION AND CO	2 ANALYSIS	Space Heating Fi (kWh/m² p.a.) Space	N/A 19,52 el type Heating Domestic Water (XWhirr) Electricity 30,652	Hot Fuel ty r Domesti p.a.) Wate	pe Hot r		0 NED ENERGY CONSI			GREEN' BER - SOUI		0 I	NIA -13,093 Electrici generate renewal technolo if anolical	ty Lighting by (kWh/m² p.a. le gy	4,576 Auxillary (kWhin*p.1) 4.39497	Cooling (kWhim' p.z.) 2.86795	Natural Gas	10,136 R Grid Electricity I		Electricity generated by CHP (-)	Electricity generated by renewable technology	Enter Carbon Factor 1		Enter Carbon Factor 3		57,955 2012 CO, emissions (kgCO, p.a.) 7,711	Natural Gas			generated by CHP (-)	renewable technology	Factor 1			L-CO 8.118	2.0 CO, BRUKL BER SAP 10.0 (kgCO ₂ /m²)
Sum 279 1 270			722	N/A 8,251	: NJA	ųs	th.	w ^a	ųΦ	ų.	w ²	0		•	3,819	1,188	775	0	14,414	0	0	0	0	0	0	10,690	7,487	•	14,414	•	0	0	0	0	0	10,690 3,	12.4
SITE-WIDE ENERGY CONSUMPTION A		ALYSIS	144	8,282	N/A										0,019	1,100	119		15,615						,	10,020		,	19,019						,	.0,030	12.4
					·				REGULATED E	NERGY CONSUM	PTION																REGULATED CO ₂									REGU	ATED CO2 EMISSIONS
Use Total Area (m²)	Calculated BER 2012 (kgCO ₂ / m ²)		Space Heating	Domestic	Hot	Space Heating	,	Domestic Hot Water		Space and Domestic Hot	ge	Electricity enerated by S	econdary	Electrici generated	ty by Lighting	Auxiliary	Cooling										2012 CO, emissions									SAP 1	0.0 CO ₂ Calculated sions BER SAP 10.0
				Domestic Water (kWh p	a.) 44 ⁸	Space Heating (Heat source 2 (kWh p.a.)	#1/P	Domestic Hot Water (Heat source 2) (kWh p.a.)	HIP.	Space and Domestic Hot Vater from CHP (kWh p.a.)	HIP #	Electricity enerated by Si CHP Heat (kWh p.a.) (ki applicable	ting system kWh p.a.)	Electrici generated renewab (kWh p.a if applical	le (kWh p.a.)	Auxiliary (kWh p.a.)	(kWh p.a.)																			HIP emis	sions BER SAP 10.0 (kgCO ₂ / m ²)
Sum 1,996	12.7		16,719	27,81	1	0		0		0		0	0	-13,093	11,406	5,763	775										25,436									11,	419 5.7

				_			
- maratia	SAP 201	2 Performance			SAP 10.0 l	Performance	
Omestic	missions after each stage of the	Energy Hierarchy for domestic	buildings	Table 1: Carbon Dioxide	Emissions after each stage of the	Energy Hierarchy for domestic	buildings
	Carbon Dioxide Emission	ns for domestic buildings ₂ per annum)			Carbon Dioxide Emissio (Tonnes CO	ns for domestic buildings ₂ per annum)	
laseline: Part L 2013 of	Regulated	Unregulated		Baseline: Part L 2013 of	Regulated	Unregulated	
ne Building Regulations compliant Development fter energy demand	28.3	29.8		the Building Regulations Compliant Development After energy demand	25.0	13.4	
uction (be lean) r heat network	27.8	29.8		reduction (be lean) After heat network	23.7	13.4	
ction (be clean) enewable energy				connection (be clean) After renewable energy			
reen)	18.0	29.8		(be green)	8.1	13.4	
e 2: Regulated Carbo	n Dioxide savinos from each stac	ge of the Energy Hierarchy for d	omestic buildinas	Table 2: Regulated Carb	on Dioxide savinos from each star		omestic buildinas
		carbon dioxide savings				carbon dioxide savings	
lean: savings from rgy demand reduction	(Tonnes CO ₂ per annum) 0.5	2%		Be lean: Savings from	(Tonnes CO ₂ per annum)	5%	
gy demand reduction lean: savings from t network	0.0	0%		energy demand reduction Be clean: Savings from heat network	0.0	0%	
reen: savings from	9.8	35%		Ba cream: Swinge from	15.6	63%	
wable energy rulative on site	10.3	37%		renewable energy Cumulative on site	16.9	68%	
ngs ual savings from off- payment	18.0			Savings Annual savings from off- set payment	8.1		
		es CO ₂)				es CO ₂)	
ulative savings for et payment	539			Cumulative savings for off-set payment	242		
in-lieu contribution	01,171			Cash in-lieu contributio	22,973		
n price is based on Local Planning Aut I-domestic	GLA recommended price of £95 hority price is inputted in the 'De	per tonne of carbon dioxide syelcoment Information' tab		*carbon price is based on unless Local Planning Au	GLA recommended price of £95 thority price is inputted in the 'De	per tonne of carbon dioxide velopment information' tab	
	missions after each stage of the	Energy Hierarchy for non-dome	stic buildings	Table 3: Carbon Dioxide	Emissions after each stage of the	Energy Hierarchy for non-dome	estic buildings
	Carbon Dioxide Emissions	for non-domestic buildings per annum)			Carbon Dioxide Emissions	for non-domestic buildings	
ine: Part L 2013 of	Regulated	Unregulated		Baseline: Part L 2013 of	Regulated	Unregulated	
uilding Regulations diant Development	7.0	5.5		the Building Regulations Compliant Development	4.5	2.5	
energy demand tion (be lean)	5.3	5.5		After energy demand reduction (be lean)	3.6	2.5	
neat network ction (be clean)	5.3	5.5		After heat network connection (be clean)	3.6	2.5	
ewable energy n)	7.5	5.5		After renewable energy (be green)	3.4	2.5	
	n Dioxide savings from each stap	ge of the Energy Hierarchy 6	on-domestic buildings		on Dioxide savings from each sta	ge of the Energy Hierarchy for -	on-domestic holidi-
		c carbon dioxide savings				c carbon dioxide savings	
	(Tonnes CO ₂ per annum)				(Tonnes CO, per annum)	carbon dioxide savings	
n: savings from y demand reduction	1.7	24%		Be lean: savings from energy demand reduction	0.8	19%	
n: savings from twork	0.0	0%		Be clean: savings from heat network	0.0	0%	
en: savings from ble energy	-22	-31%		Be green: savings from renewable energy	0.3	6%	
umulative	-0.5	-6%		Total Cumulative Savings	1.1	25%	
savings from off- ment	7.5			Annual savings from off-	3.4	-	
				set payment			
ulative savings for		es CO ₂)		set payment Cumulative savings for	(Tonn	es CO ₂)	
set payment	224			Cumulative savings for off-set payment Cash in-lieu contributio	101		
et payment in-lieu contribution rbon price is based o	224			set payment Cumulative savings for off-set payment Cash in-lieu contributio (E)*	101 n 9,572	-	
et payment in-lieu contribution rbon price is based o	224 21,321 n GLA recommended price of £9 authority price is inputted in the "	25 per tonne of carbon dioxide Development Information [†] tab		cumulative savings for off-set payment Cash in-lieu contributio (E)*	n 9,572 GLA recommended price of £95 (hority price is inputted in the 'De	per tonne of carbon dioxide velopment information tab	
set payment h in-lieu contribution arbon price is based o	224 21,321 n GLA recommended price of £9		Percentage savings (%)	set payment Cumulative savings for off-set payment Cash in-lieu contributio (E)*	101 n 9,572	-	Percentage savings (%)
t payment in-lieu contribution bon price is based o ses local Planning A E-WIDE	224 21,321 n GLA recommended price of £9 authority price is inputted in the "	26 per tonne of carbon dioxide Development information' tab CO ₂ savings		set payment Cumulative savings for off-set payment Cash in-lieu contributio (E)*	n 9,572 GLA recommended price of £95 (hority price is inputted in the 'De	per tonne of carbon dioxide velopment Information' tab	savings
in lieu contribution ton price is based o ess Local Planning A E-WIDE	224 21,321 n GLA recommended price of £9 affords price is inputted in the T Total regulated emissions (Tonnes CO ₂ / year)	26 per tonne of carbon dioxide Development information' tab CO ₂ savings		set payment Cumulative savings for off-set payment Cash in-lieu contribution (CP *custon price is based on unless Local Planning Au	9,572 GLA recommended price of £95 shortly price is inputted in the De Total regulated emissions (Tonnes CO ₂ / year)	per tonne of carbon dioxide velopment Information' tab	savings
t payment in-lieu contribution bon price is based o ses toos! Pannino / E-WIDE 2013 baseline in	224 21,321 a GLA recommended price of S3 othority orice is positive in the 1 Total regulated emissions (Tonnes CO _L I year) 35.3 33.1 33.1		savings (19 6%	comulative savings for offer a savings for offer at payment Cash in-like contribute of Particular State of State of State of Particular State of P	101 8,572 GLA recommended price of £56 of	per tonne of carbon dioxide exhauses of the formation hab CO ₂ savings (Tonnes CO ₂ / year)	5avings (%) 7%
t payment in-lieu contribution bon price is based o bon price is based o bon price is based bon price is bas	224 21,321 GLA recommended price of SS althority rides in incuffed in the Jacobs (Tennes CO _L / year) 35.3 33.1 33.1	. S per torne of carbon diciside Devisioners in Information 1 tib CO ₂ savings (Tennes CO ₂ / year) 2.2 0.0 7.6	53vings (%) 6% 6% 6% 22%	comulative savings for offset a savings for offset at payment Cash in-like contribution (IP) Turbice priors is based on solves saved Patronia Autorition priors is based on solves saved Patronia Autorition (IP) Part L 2013 basedine Be Isan Be deam Be green	101 9,572 GLA recommended price of £105 factors of £105 fact	per tonne of carbon disside extensioners beforestor tab. CO ₂ savings (Tonnes CO ₂ / year) 2.1 0.0 15.9	53vings (%) 7% 0% 54%
t payment in-lieu contribution tine is based o set toout Planning A E-WIDE 2013 baseline n an	21,321 21,321 GLA normanded price of \$5 GLA	G per tronne of carbon disoble Cota parvings (Tonnes COt, I year) 22 0.0 7.6	savings (%) 6% 6% 22% 28%	comulative savings for offer a savings for offer at payment Cash in-like contribute of Particular State of State of State of Particular State of P	9,572 GLA recommended price of £155 facts recommended price of £155 facts record in new Del Total regulated emissions (Tonnes CO; I year) 27.3 27.3	per tone of carbon disable content of carbon	54% 61%
paymentlieu contribution mortes is based on other to say the contribution of th	22.4 21.321 GLA normanded price of SI Andrew	G per tenne of cathon disoble CO ₂ savings (Tonnes CO ₃ year) 22 0.0 7.6 9.9 CO ₃ savings off-set (Tonnes CO ₃)	savings (%) 6% 6% 22% 28%	Cumulative swings for offer a swings for offer a payment Cash in-five contribution EV To the state of the swings of the state of swings in these of swings in the state of swings in the swings of swings in the swings of swings of the swings	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per tonne of carbon dioxide extraored frames CD ₂ yearings (Tonnes CD ₂ year) 2.1 0.0 15.9 11.0 CO ₂ savings off-set (Tonnes CD ₂)	54% 61% -
payment lieu contribution mortes is based of oss to only Damens /	21,321 21,321 GLA normanded price of \$5 GLA	. Dispertance of cabon disable Development of cabon disable Development of themselver lab (CO ₂ savings (Tomess CO ₄) year) 2.2 0.0 7.6 CO ₃ savings off set	savings (%) 6% 6% 22% 28%	comulative savings for offset a savings for offset at payment Cash in-like contribution (IP) Turbice priors is based on solves saved Patronia Autorition priors is based on solves saved Patronia Autorition (IP) Part L 2013 basedine Be Isan Be deam Be green	9,572 GLA recommended price of £155 facts recommended price of £155 facts record in new Del Total regulated emissions (Tonnes CO; I year) 27.3 27.3	per tone of carbon disable content of carbon	7% 0% 54% 61%
payment lieu contribution mortes is based of oss to only Damens /	224 21,221 GLA recommended prior of \$5 are included in the area of the commended prior of \$5 are included in the area of the commended prior of \$5 area of the commended prior of the c	CO, serings (fonces CO ₂) 783.1	savings (%) 6% 0% 0% 22% 28%	Cumulative swings for offer a swings for offer a payment Cash in-five contribution EV To the state of the swings of the state of swings in these of swings in the state of swings in the swings of swings in the swings of swings of the swings	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per tonne of carbon dioxide extraored frames CD ₂ yearings (Tonnes CD ₂ year) 2.1 0.0 15.9 11.0 CO ₂ savings off-set (Tonnes CD ₂)	54% 61% -
p payment in life is a contribution in life is a contribution or contribution	22.4 21.321 GLA normanded price of SI Andrew	G per tenne of cathon disoble CO ₂ savings (Tonnes CO ₃ year) 22 0.0 7.6 9.9 CO ₃ savings off-set (Tonnes CO ₃)	savings (%) 6% 6% 22% 28%	Cumulative swings for offer a swings for offer a payment Cash in-five contribution EV To the state of the swings of the state of swings in these of swings in the state of swings in the swings of swings in the swings of swings of the swings	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per tonne of carbon dioxide extraored frames CD ₂ yearings (Tonnes CD ₂ year) 2.1 0.0 15.9 11.0 CO ₂ savings off-set (Tonnes CD ₂)	54% 61% -
st payment in-lieu contribution in-lieu contribution in-lieu contribution price is based on one (see Blanchez / E-WIDE - 2013 baseline an anaman eeen seen seen seen seen seen seen se	224 224 1GLA normanded price of \$5 are a continued and a continued and a continued are a continued and a conti	Co, serings (fonces CO ₂) year) CO, serings (fonces CO ₂) year) 22 20 7.6 8.9 CO, savings (fonces CO ₂) year) To Savings off set (fonces CO ₃) Welling Fabric Energy (MMhirr) Still Dwelling Fabric Energy (MMhirr)	savings (19 / 19 / 19 / 19 / 19 / 19 / 19 / 19	Cumulative swings for offer a swings for offer a payment Cash in-five contribution EV To the state of the swings of the state of swings in these of swings in the state of swings in the swings of swings in the swings of swings of the swings	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per tonne of carbon dioxide extraored frames CD ₂ yearings (Tonnes CD ₂ year) 2.1 0.0 15.9 11.0 CO ₂ savings off-set (Tonnes CD ₂)	54% 61% -
payment in fee contribution of the contribution of the contribution price is based on the contribution of	224 21,321 CILA recommended prior of £2 CILATE GLA recommended prior of £2 CILATE Control regulated emissions (fromes CO ₂ / yaw) 35.3 33.1 33.1 25.4	Disperture of cabon disable Development of cabon disable Development of borns (or 1 show door 1 show d	savings (19 / 19 / 19 / 19 / 19 / 19 / 19 / 19	Cumulative swings for offer a swings for offer a payment Cash in-five contribution EV To the state of the swings of the state of swings in these of swings in the state of swings in the swings of swings in the swings of swings of the swings	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per tonne of carbon dioxide extraored frames CD ₂ yearings (Tonnes CD ₂ year) 2.1 0.0 15.9 11.0 CO ₂ savings off-set (Tonnes CD ₂)	54% 61% -
syment (less contribution price is based of coal Planning A (1) and 1) a	224 21,201 GLA recommended price of \$5 colors of the color	Design Fabric Every Design (Formes CQ) 76 69 CQ, savings (Formes CQ, year) 22 Q CQ, savings (Formes CQ, year) 89 CQ, savings off set (Formes CQ) 783.1 Design Fabric Every Efficiency (Withliam) Total rara weighted non-dimension	savings (19 / 19 / 19 / 19 / 19 / 19 / 19 / 19	Cumulative swings for offer a swings for offer a payment Cash in-five contribution EV To the state of the swings of the state of swings in these of swings in the state of swings in the swings of swings in the swings of swings of the swings	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per tonne of carbon dioxide extraored frames CD ₂ yearings (Tonnes CD ₂ year) 2.1 0.0 15.9 11.0 CO ₂ savings off-set (Tonnes CD ₂)	54% 61% -
ymeet ue contribution price is based of coal Planning A WIDE 13 baseline	224 21,221 CLA recommended prior of \$5 are instances along the control of the con	CO, savings (fonces CO ₂) year) CO, savings (fonces CO ₂) year) 22 23 39 CO, savings offers (fonces CO ₂) year) 7.6 9.9 CO, savings off set (fonces CO ₂) Efficiency (Whiter) Total are swiphted non-downstate cooling demand (Mayers)	savings (%) 6% 0% 0% 22% 28% 	Cumulative swings for other payment Cash in-flee contribute of the payment Cash in-flee contribute of the cash of	9,572 GLA recommended price of 5/56 footh once in position in the 26 Total regulated emissions (Tonnes CO; / year) 29.4 27.3 11.4	per torne of carbon dioxide selectment in the carbon dioxide selectment in the carbon dioxide ca	54% 61% -
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OUR SERVICE LINES









TECHNICAL DUE DILIGENCE PROJECT MONITORING

SUSTAINABILITY

DILAPIDATIONS









PROJECT CONSULTANCY

COST CONSULTANCY

M+E CONSULTANCY DEVELOPMENT CONSULTANCY









PRINCIPAL DESIGNER INSURANCE ASSESSMENT

DISASTER RESPONSE

PARTY WALLS









EXPERT WITNESS

DESIGN

COMPLIANCE

RIGHTS OF LIGHT

OUR MARKET SECTORS









OFFICE

RETAIL

INDUSTRIAL

EDUCATION









LEISURE

HERITAGE

RESIDENTIAL

MIXED-USE