

Sustainability & Energy Strategy Report

For the site of: 138-140 Highgate Road, Highgate, London NW5 1PB

For: Design Ventures Highgate Limited

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I. Executive Summary

This Energy Statement demonstrates the predicted energy performance and carbon dioxide emissions of the proposed development at 138-140 Highgate Road, Highgate, London, NW5 1PB based on the information provided by the design team. The development will comprise of 6 x 4 bedrooms residential units within the London Borough of Camden.

I.I. Policy Requirements

The Council requires new developments to incorporate sustainable design and construction measures. The table below summarises the local policy requirements for the proposed development.

Policies	Requirements	Compliance Check
London Plan 5.2 Policy CC1	An overall 19% reduction of carbon emissions over the Building Regulation levels (Part L 2013).	The development achieved an overall carbon reduction of 23.56% over Part L 2013 baseline via energy efficient measures and PV panels on the site.
London Policy 5.2 Policy DP22	Code for Sustainable Home (CSH) Level 4 Encourage CSH Level 6 (zero carbon) by 2016	As CSH was withdrawn by the government as of April 2015, a preassessment has not been provided as part of this report.

Table 1 Policy Requirements

1.2. Methodology and Strategies

The methodology used to determine the CO₂ emissions is in accordance with the London Plan's three-step Energy Hierarchy (Policy 5.2). The below table shows the Energy Hierarchy and suggested strategies for the proposed development.

Stages	Strategies
BE LEAN Energy efficient design	 U-values and air permeability better than Building Regulations Part L. Accredited Construction Details for all junctions Natural ventilation with extract fans in wet rooms Low energy lights
BE CLEAN District heat networks or communal heating systems	N/A
BE GREEN On-site renewable technologies	Individual Air Source Heat Pump for heating and hot water and PV panels of 5.67 kWp on the roof (approximate 18 panels with 315 w/p are required).

Table 2 Energy Hierarchy and suggested strategies

1.3. Assessment Results

After the application of all strategies based on the Energy Hierarchy, the regulated carbon dioxide emissions have been reduced as follows:

Energy Hierarchy		Carbon Emissions (tonnesCO ₂ /year) Regulated
BASELINE	TER set by Building Regulations 2013 Part L	17.27
BE LEAN	After energy demand reduction	13.41
BE CLEAN	After CHP/ Communal Heating	13.41
BE GREEN	After renewable energy	13.20

Table 3 Carbon Emissions after each stage of the proposed strategy

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

Energy Hierarchy		Regulated Carbon Savings		
			%	
BE LEAN	BE LEAN After energy demand reduction		22.35 %	
BE CLEAN	After heat network/ CHP	0	0%	
BE GREEN	After renewable energy		1.56%	
Total Cumulative Savings		4.07	23.56%	
Total Targe	Total Target Savings		19 %	

Table 4 Carbon dioxide Emissions after each stage of the Energy Hierarchy

The Energy Hierarchy

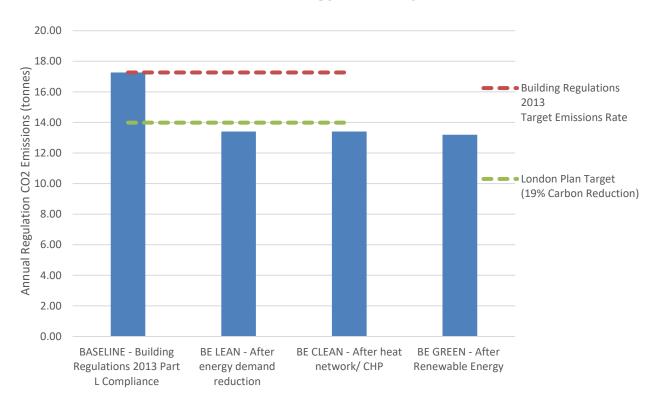


Figure 1 The Energy Hierarchy

2. Introduction

This Energy Statement will be included as part of the planning application that addresses the environmental impact of the development. This report focuses on the energy strategy for the proposed scheme and how energy consumption and carbon emissions will be minimised and to meet the targeted carbon emissions in accordance with the London Plan and Local planning policy.

The development is to be located in the **London Borough of Camden** and it is in close proximity to Gospel Oak train station (approximately 0.2 miles to the South west) and Tufnell Park underground station (approximately 0.4 miles to the East). The proposal is 6 x 4 bedrooms residential units **at 138-140 Highgate Road, Highgate, London, NW5 1PB.**



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

EW CONSTRUCTION						
Type Name of unit		Floor	No. of Bedrooms	Floor Area (m ²)		
Residential	Unit 01	Basement, GF,FF	4	113.72		
Residential	Unit 02	Basement, GF,FF	4	107.40		
Residential	Unit 03	Basement, GF,FF	4	108.17		
Residential	Unit 04	Basement, GF,FF	4	109.12		
Residential	Unit 05	Basement, GF,FF	4	109.21		
Residential	Unit 06	Basement, GF,FF	4	104.81		
Total	-	-	-	652.43		

Table 5 Proposed units to be assessed for the development

3. Planning Policy

3.1. National Planning Policy Framework (March 2012)

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

3.2. The London Plan (March 2016)

MAYOR OF LONDON



THE LONDON PLAN
THE SPATIAL DEVELOPMENT STRATEGY FOR LONDON
CONSOLIDATED WITH ALTERATIONS SINCE 2011

MARCH 2016

Policy 5.2, 5.4, 5.5, 5.6, & 5.7

According to Policy 5.2 all major new developments should show carbon emissions reduction through the Mayor's energy hierarchy (Be Lean, Be Clean and Be Green), unless it can be demonstrated that such provision is not feasible. From October 2016 Zero Carbon Standard apply to all new major residential development (10 or more units). This means that at least 35% of carbon reductions against a Building Regulations Part L 2013 must be achieved on-site, with the remaining emissions, up to 100%, to be offset through a contribution to the Council's Carbon Offset Fund. For the non-residential development, must achieve a 35% reduction in CO₂ emissions against a Building Regulations Part L 2013 baseline.

For retrofitting developments, it will be a challenge to meet these targets. However, available reductions in carbon emissions should be demonstrated along with water saving measures as per Policy 5.4.

Furthermore, intent must be shown for connecting to a Decentralised Energy Network and utilising a Combined

Heat & Power according to Policy 5.5 and 5.6. The Mayor and boroughs should in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from onsite renewable energy generation according to paragraph 5.42 of Policy 5.7

3.3. London Borough of Camden



Core Strategy (Adopted in 2010)

Policy CS13 – Tackling climate change through promoting higher environmental standards Reducing the effects of and adapting to climate change

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

- a) Ensuring patterns of land use that minimize the need to travel by car and hep support local energy networks;
- b) Promoting the efficient use of land and buildings;
- c) Minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:
 - Ensuring developments use less energy,
 - Making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks:
 - Generating renewable energy on-site; and
- d) Ensuring buildings and spaces are designed to cope with, and minimize the effects of, climate change.

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

Local energy generation

The Council will promote local energy generation and networks by:

- e) Working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of:
 - Housing estates with community heating or the potential for community heating and other uses with large heating loads;
 - The growth areas of King's Cross, Euston, Tottenham Court Road; West Hampstead Interchange and Holborn;
 - Schools to be redeveloped as part of Building Schools for the Future programme;
 - Existing or approved combined heat and power/local energy networks and other locations where land ownership would facilitate their implementation.
- f) Protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

Water and surface water flooding

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

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

Camden's carbon reduction measures

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

- j) Taking measures to reduce its own carbon emissions;
- k) Trialing new energy efficient technologies, where feasible; and
- I) Raising awareness on mitigation and adaptation measures.

Local Development Framework (Adopted in 2010)

Policy DP22 – Promoting sustainable design and construction

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

- a) Demonstrate how sustainable development principles, have been incorporated into the design and proposed implementation; and
- b) Incorporate green or brown roofs and green walls whenever suitable.

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

- c) Expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016;
- d) Expecting developments (except new build) of 500 sq. m of residential floorspace or above or 5 or more dwellings to achieve "very good" in Eco Homes assessments prior to 2013 and encouraging "excellent" from 2013;
- e) Expecting non-domestic developments of 500sqm of floorspace or above to achieve "very good" in BREEAM assessments and 2excellent" from 2016 and encouraging zero carbon from 2019.

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

- f) Summer shading and planting;
- g) Limiting run-off;
- h) Reducing water consumption;
- i) Reducing air pollution; and
- j) Not locating vulnerable uses in basements in flood-prone areas.

Camden Local Plan (Adopted in 2017)

Policy CC1 – Climate change mitigation

The energy hierarchy

The Council's Sustainability Plan 'Green Action for Change' commits the Council to seek low and where possible zero carbon buildings. New developments in Camden will be expected to be designed to minimise energy use and CO2 emissions in operation through the application of the energy hierarchy. It is understood that some sustainable design measures may be challenging for listed buildings and some conservation areas and we would advise developers to engage early with the Council to develop innovative solutions.

The energy hierarchy is a sequence of steps that minimise the energy consumption of a building. Buildings designed in line with the energy hierarchy prioritise lower cost passive design measures, such as improved fabric performance over higher cost active systems such as renewable energy technologies.

All developments involving five or more dwellings and/or more than 500 sqm of (gross internal) any floorspace will be required to submit an energy statement demonstrating how the energy hierarchy has been applied to make the fullest contribution to CO2 reduction. All new residential development will also be required to demonstrate a 19% CO2 reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy). This can be demonstrated through an energy statement or sustainability statement.

4. Sustainability Statement

4.1. Water Efficiency

In accordance with London Plan SPG Sustainable Design and Construction 2.6, London Plan policy 5.3/ 5.4/ 5.13/ 5.15 (see below summary table), 8.44/ CC3 8.55 of local plan, policy CC2 and in accordance with Camden Planning Guidance CPG3 the development will be based upon the specification of **water efficient fittings** including low volume dual flush WCs, and low flow taps/ showers/ bath. These measures will result in a water consumption rate of **105 litres/person/day or less and 5 l/p/day external use.** To manage the impacts of inefficiencies and leakage, water meters and leak detection systems on the mains water supply will be installed where feasible.

Water Efficiency	
Mayor's Priority	London Plan Policy
Developers should maximise the opportunities for water saving measures and	5.3, 5.13, 5.15
appliances in all developments, including the reuse and using alternative	
sources of water.	
Mayor's Priority	London Plan Policy
Developers should design residential schemes to meet a water consumption	5.3, 5.15
rate of 105 litres or less per person per day.	
Mayor's Priority	London Plan Policy
Where a building is to be retained, water efficiency measures should be	5.3, 5.4, 5.15
retrofitted.	
Mayor's Priority	London Plan Policy
All developments should be designed to incorporate rainwater harvesting.	5.3, 5.13, 5.15
Mayor's Priority	London Plan Policy
All residential units, including individual flats / apartments and commercial	5.15
units, and where practical, individual leases in large commercial properties	
should be metered.	

Table 6 Summary of the Mayor's priorities and best practice set by SPG

The proposed water calculations table is provided below which provides the guidance as how each unit can achieve the internal/ external water use.

The water calculator for new dwellings						
Installation Type	Unit of Measure	Capacity/ flow rate (1)	Use factor (2)	Fixed use (litres/perso n/day) (3)	Litres/person/day = [(1) x (2)] +(3) (4)	
WC (single flush)	Flush Volume (litres)	-	4.42	0.00	-	
WC (dual flush)	Full Flush Volume (litres)	4	1.46	0.00	5.84	
	Part flush Volume (litres)	2.6	2.96	0.00	7.70	



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WCs (multiple fittings)	Average effective flushing volume (litres)	-	4.42	0.00	-	
Taps (excluding kitchen/ utility room taps)	Flow rate (litres/minute)	5	1.58	1.58	9.48	
Bath (where shower also present)	Capacity to overflow (litres)	180	0.11	0.00	19.80	
Shower (where bath also present)	Flow rate (litres/minute)	8	4.37	0.00	34.96	
Bath only	Capacity to overflow (litres)	-	0.5	0.00	-	
Shower only	Flow rate (litres/minute)	•	5.6	0.00	-	
Kitchen / utility room sink taps	Flow rate (litres/minute)	8	0.44	10.36	13.88	
Washing machine	Flow rate (litres/minute)	8.17	2.1	0.00	17.16	
Dishwasher	Litres/place setting	1.25	3.6	0.00	4.50	
Waste disposal unit	Litres/use	If present = 1 If absent = 0	3.08	0.00	0	
Water Softener	Litres/person/day	-	1.00	0.00	-	
	(5)	Total calculated person/day) = (113.3	
	(6)	Contribution fro (litres/person/d	• .	ater	0	
	(7)	Contribution fro (litres/person/d		ter	0	
	(8)	Normalisation Factor			0.91	
	(9)	Total water consumption (litres/ person/day) = [(5)-(6)-(7)]*(8)			103.1	
	(10)	External water use			5	
	(11)		Total water consumption (litres/ person/day) = (9)+(10)			

4.2. Materials

The development will utilise **low embodied materials** - at least three of the key elements of the building envelope are to achieve a rating of A+ to D in the BRE's The Green Guide of specification. At least 50% of timber and timber products will be sourced from accredited Forest Stewardship Council **(FSC)** or Programme for the Endorsement of forestry certification **(PEFC)** where feasible. All material used will be durable to cater for their level of use and exposure and will not release toxins into the internal and external environment where feasible. This is in line with SPG Sustainable Design and Construction 2.7 and London Plan policy 5.3, 5.20, 7.6, and 7.14 as specified below table.

Materials – Design phase		
Mayor's Priority	London Plan Policy	
The design of development should prioritise materials that:	5.3, 5.20, 7.6, 7.14	
o have a low embodied energy, including those that can be re-used		
intact or recycled;		
o at least three of the key elements of the building envelope (external		
walls, windows roof, upper floor slabs, internal walls, floor finishes /		
coverings) are to achieve a rating of A+ to D in the BRE's <i>The Green Guide</i> of		
specification;		
o can be sustainably sourced;		
o at least 50% of timber and timber products should be sourced from		
accredited Forest Stewardship Council (FSC) or Programme for the		
Endorsement of forestry Certification (PEFC) source;		
o are durable to cater for their level of use and exposure; and		
will not release toxins into the internal and external environment, including		
those that deplete stratospheric ozone		
Mayor's Priority	London Plan Policy	
The design of developments should maximise the potential to use pre-	5.3, 7.6	
fabrication elements.		

Table 7 Summary of the Mayor's priorities set by SPG

4.3. Waste

The construction waste will be considered to **minimise**, **recycle and reuse** on site where possible, this will reduce the overall construction cost and at the same time minimise the amount of waste diverting to landfill. **Site Waste Management Plan (SWMP)** will be formalised before the construction works start and updated as the works continue on the site.

The proposed development will adopt the best waste management procedures to reduce the amount of waste going to landfill. This will be established by creating provisions for recycling and also waste segregation from general to recyclable waste. This development has **separated bin storages on the upper ground floor level for each unit,** and the storages include refuse, recycling, composting bins with enough sizes in accordance with borough requirements. This is in line with SPG Sustainable Design and Construction 2.7 and London Plan policy 5.3 and 5.17 as below table.

Waste		
Construction phase		
Mayor's Priority	London Plan Policy	
Developers should maximise the use of existing resources and materials and	5.3, 5.20	
minimise waste generated during the demolition and construction process		
through the implementation of the waste hierarchy.		
Occupation phase		
Mayor's Priority	London Plan Policy	
Developers should provide sufficient internal space for the storage of	5.3, 5.17	
recyclable and compostable materials and waste in their schemes.		
Mayor's Priority	London Plan Policy	
The design of development should meet borough requirements for the size	5.3, 5.17	
and location of recycling, composting and refuse storage and its removal.		

Table 8 Summary of the Mayor's priorities set by SPG

4.4. Nature conservation and biodiversity

There will be **no loss in the quality and quantity of biodiversity** by this development as all the units have the back gardens which contributes towards the enhancement of biodiversity. And, the development will make a positive contribution to biodiversity on the site in the course of design development. This is related with SPG Sustainable Design and Construction 2.8 / 3.3 and London Plan policy 5.3, 5.10, and 7.19.

Nature conservation and biodiversity		
Mayor's Priority	London Plan Policy	
There is no net loss in the quality and quantity of biodiversity.	5.3, 7.19	
Mayor's Priority	London Plan Policy	
Developers make a contribution to biodiversity on their development site.	5.3, 7.19	

Table 9 Summary of the Mayor's priorities set by SPG

4.5. Flood Risk

The Environmental Agency map shows that the site surrounding area is within zone 1 of the flood risk (see below image). If feasible, the SuDs would be developed in the course of design development in order to consider attenuation for surface water runoff as well as habitat, water quality and amenity benefits in accordance with SPG Sustainable Design and Construction 3.4 and London Plan policy 5.3, 5.13, and 5.14 below. Therefore, there would be a net decrease in both the volume and rate of run-off leaving the site. As part of this, **permeable paving materials** will be used on the ground floor to avoid, reduce and delay the discharge of rainfall to public sewers and watercourses. And also, rainwater collection and recycling systems would be considered at detailed design stage where feasible.



Figure 3 The Environmental Agency Map

Flooding		
Surface water flooding and Sustainable drainage		
Mayor's Priority	London Plan Policy	
Through their Local Flood Risk Management Strategies boroughs should	5.3, 5.12	
identify areas where there are particular surface water management issues		
and develop policies and actions to address these risks		
Mayor's Priority	London Plan Policy	
Developers should maximise all opportunities to achieve greenfield runoff	5.12, 5.13	
rates in their developments		
Mayor's Priority	London Plan Policy	

When designing their schemes developers should follow the drainage	5.13
hierarchy set out in London Plan policy 5.13	
Mayor's Priority	London Plan Policy
Developers should design Sustainable Drainage Systems (SuDS) into their	5.3, 5.13, 5.14
schemes that incorporate attenuation for surface water runoff as well as	
habitat, water quality and amenity benefits.	
Flood resilience and resistance of buildings in flood risk areas	
Mayor's Priority	London Plan Policy
Development in areas at risk from any form of flooding should include flood	5.3, 5.12, 5,13
resistance and resilience measures in line with industry best practice.	
Flood Risk Management	
Mayor's Priority	London Plan Policy
Developments are designed to be flexible and capable of being adapted to	5.3, 5.12
and mitigating the potential increase in flood risk as a result of climate	
change.	
Mayor's Priority	London Plan Policy
Developments incorporate the recommendation of the TE2100 plan for the	5.3, 5.12
future tidal flood risk management in the Thames estuary.	
Mayor's Priority	London Plan Policy
Where development is permitted in a flood risk zone, appropriate residual	5.3, 5.12
risk management measures are to be incorporated into the design to ensure	
resilience and the safety of occupiers.	
Other sources of flooding	
Mayor's Priority	London Plan Policy
All sources of flooding need to be considered when designing and	5.3, 5.12, 5.13
constructing developments.	

Table 10 Summary of the Mayor's priorities set by SPG

4.6. Pollution

Air

The proposed scheme has been designed to minimise the generation of air pollution and mitigate against increased exposure to poor air quality. This will include **low/No NOx heating systems and non-toxic building materials** where feasible. The proposal is to install NOx neutral Air Source Heat Pump system on site for each unit. Contractor will follow the guidance set out in the emerging Minimising dust and emissions from construction and demolition SPG when constructing their development.

Air quality	
Mayor's Priority	London Plan Policy
Developers are to design their schemes so that they are at least 'air quality neutral'.	7.14
Mayor's Priority	London Plan Policy
Developments should be designed to minimise the generation of air pollution.	5.3, 7.14
Mayor's Priority	London Plan Policy

Developments should be designed to minimise and mitigate against increased	3.2, 5.3, 7.14
exposure to poor air quality.	
Mayor's Priority	London Plan Policy
Developers should select plant that meets the standards for emissions from	7.14
combined heat and power and biomass plants set out in Appendix 7.	
Mayor's Priority	London Plan Policy
Developers and contractors should follow the guidance set out in the	5.3, 7.14
emerging The Control of Dust and Emissions during Construction and	
Demolition SPG when constructing their development.	

Table 11 Summary of the Mayor's priorities set by SPG

Noise

The mitigation measures will be incorporated to the proposed building at construction stage to reduce sources of noise – insulate and soundproofing doors, walls, windows, floors and ceilings, and seal air gaps around windows etc.

Noise	
Mayor's Priority	London Plan Policy
Areas identified as having positive sound features or as being tranquil should	3.2, 7.15
be protected from noise.	
Mayor's Priority	London Plan Policy
Noise should be reduced at source, and then designed out of a scheme to	3.2, 5.3, 7.6,.7 .15
reduce the need for mitigation measures.	

Table 12 Summary of the Mayor's priorities set by SPG

Light

Lighting scheme will be designed to minimise light pollution where feasible. Guidance Notes for the Reduction of Obtrusive Light (2005) will be utilised to reduce obtrusive light in accordance with SPG Sustainable Design and Construction 4.5 and London Plan policy 5.2, 5.3, and 6.7.

Light pollution		
Mayor's Priority	London Plan Policy	
Developments and lighting schemes should be designed to minimise light pollution.	5.2, 5.3, 6.7	

Table 13 Summary of the Mayor's priorities set by SPG

4.7. Health and Wellbeing

The health and wellbeing of the building occupant has been considered in this development. The proposed scheme is designed to **maximise the opportunity for daylighting potential in habitable areas** – e.g. roof lights. The proposed development will ensure to introduce the **occupant controlled and zoned space heating systems** in accordance with space requirements and window orientation. This will provide occupant thermal comfort but at the same time it will reduce the overall energy cost and the carbon footprint.

5.5	Daylight and sunlight		
5.5.1	Glazing to all habitable rooms should be not less than 20% of the internal floor	Good Practice	Code for Sustainable Homes
	area of the room.		Tionics
5.5.2	All homes should provide for direct sunlight to enter at least one habitable room for part of the day. Living areas and kitchen dining spaces should preferably receive direct sunlight.	Good Practice	Code for Sustainable Homes

Table 14 GLA Sustainable Design and Construction SPG Appendix 4 – Housing SPG Design Standards

4.8. Bicycle Storage

To promote exercise and help reduce congestion and carbon emissions, **cycle storages are provided on the lower ground floor at the rear gardens.** The site contains a cycle storage spaces for each unit at the rear garden spaces as shown on the lower ground floor drawings and the provided space is sufficient to store number of cycles.

3.4	Cycle storage		
3.4.1	All developments should provide dedicated storage space for cycles at the	Baseline	LP Policy 6.9
	following levels:		
	i. 1 per 1 or 2 bedroom dwelling; or ii. 2		
	per 3 or more bedroom dwelling		
3.4.2	Individual or communal cycle storage	Baseline	Design for London
	outside the home should be secure,		
	sheltered and adequately lit, with		
	convenient access to the street. Where		
	cycle storage is provided within the		
	home, it should be in addition to the		
	minimum GIA and minimum storage and		
	circulation space requirements. Cycle		
	storage identified in habitable rooms or		
	on balconies will not be considered		
	acceptable.		

Table 15 GLA Sustainable Design and Construction SPG Appendix 4 – Housing SPG Design Standards

5. Energy Statement

5.1. Methodology - Mayor's Energy Hierarchy

The energy hierarchy is a classification of different methods to improve energy performance in a parallel sequence. This includes primarily a focus on reducing energy use by avoiding unnecessary use, to then improving the efficiency of energy systems to minimise loss, this is followed by exploiting renewable energy sources and then low carbon energy solutions for energy needs and finally, any remaining demand can be catered for by conventional fuel sources.

The Mayor's Energy Strategy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. These guiding principles have been reordered since the publication of the Mayor's Energy Strategy in Feb 2004 and the adopted replacement London Plan 2011 with further alterations in 2015 stating that the following hierarchy should be used to assess applications:

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

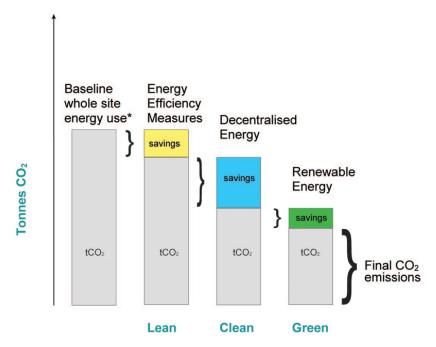


Figure 4 The Energy Hierarchy

5.2. Software and Input data

The Government approved software, i.e. **FSAP 2012**, have been utilised to carry out **Standard Assessment Procedure (SAP)** calculations.

Turner Jomas received the architectural drawings and relevant documents, and they were used to undertake the energy assessments. The document references are listed in the table below.

No.	Document Name	Format	Received Date
1	Proposed Plans - Lower Ground Floor Plan	pdf	01-02-2018
2	Proposed Plans - Ground Floor Plan	pdf	01-02-2018
3	Proposed Plans – Upper Ground Floor Plan	pdf	01-02-2018
4	Proposed Plans – Roof Plan	pdf	01-02-2018
5	Proposed Elevations	pdf	01-02-2018
6	Proposed Sections	pdf	01-02-2018
7	Site Plan	pdf	17-01-2018

Table 16 The document list

6. Energy Statement - Baseline Stage

The baseline (known as Target Emission Rate), as calculated in line with the Building Regulation 2013, is the maximum amount of carbon dioxide a dwelling or non-residential unit is allowed to emit. The Target Emission Rate (TER) includes carbon dioxide emissions which are covered by Part L of the Building Regulations, known as regulated emissions (space and water heating, ventilation, lighting, pumps, fans & controls). The baseline energy uses and resulting CO₂ emissions rates of the development have been assessed using the Government approved software.

The unregulated emissions provided in this report include energy uses that are not covered by Building Regulations; typically, energy from appliances, small power and cooking. The unregulated emissions for the domestic dwellings have been calculated following the SAP 2009 technical guidance, based on the BREDEM methodology.

The baseline regulated CO₂ emissions for the development as a whole are presented in the tables below:

4 BASELINE

BASELINE: TER	Regulated CO ₂ Emissions (kg CO ₂ /yr)
Unit 01	3329.72
Unit 02	2736.55
Unit 03	2748.60
Unit 04	2764.01
Unit 05	2764.11
Unit 06	2925.25
TOTAL	17268.24

Table 17 Regulated Energy Use and Carbon Emissions at Baseline

7. Energy Statement - BE LEAN Stage

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

7.1. Passive Design Measures

Enhanced Building Elements

At the 'BE LEAN' stage of the energy hierarchy, energy efficient building elements have been incorporated into the build. The heat loss of different building element is dependent upon their U-value, air tightness, and thermal bridging y-values. Therefore, better U-values and air permeability than the minimum values set in the Part L 2013 have been suggested in this development. And, Accredited Construction Detail for Part L was also applied for all thermal bridging junctions to reduce the heat loss from the thermal bridging. Please see below more specifically:

		Part L 2013 min. required values L1A	Proposed building values
	Wall	0.30	0.15
	Window	2.00	1.4
U-value (W/m² K)	Lloor		0.13
	Roof	0.20	0.13
	Door	1.0	1.4
Air Permeability (m³/h.m² at 50 Pa)		10	4
Use of Accr Construction		for residentia	YES g calculations have been carried out al units based on ACD for Part L) portal.gov.uk/buildingregulations/approved partl/bcassociateddocuments9/acd

Table 18 Proposed Building Elements

Orientation & Natural Daylighting

Passive solar gain reduces the amount of energy required for space heating during the winter months. The building is typically positioned to have south and south west aspects, so they align with the roads and also maximise the passive solar gains into the building throughout the day. Moreover, the internal layout of the development has been designed to improve daylighting in all habitable spaces, as a way of improving the health and wellbeing of occupants.

Cooling and Overheating Hierarchy

Based on the GLA guidance on preparing energy assessment (March 2016), various strategies have been considered for this development to reduce the cooling demand and the overheating risks. This follows below cooling hierarchy set by London Plan Policy 5.9, Camden Local Plan Policy CC1 and CC2, planning guidance CPG3 and CP2.

- Firstly, internal heat generation will be minimised through energy efficient design in the course of design development. It will include minimizing pipe lengths (particularly lateral pipework in corridors of flats) and adopting pipe configurations which minimise heat loss, e.g. twin pipes. Due to the type of scheme this is not impacted as there aren't any communal corridors etc. for this scheme.
- ✓ Moreover, the amount of heat entering building in summer will be reduced through use of shading measures including internal blinds or curtains in the habitable rooms. Passive design: shading and orientation to reduce excessive solar gain in summer. Passive buildings aim to maintain interior thermal comfort throughout the sun's daily and annual cycles whilst reducing the requirement for active heating and cooling systems.
- ✓ Next, the internal layout provides the dwellings the passive ventilation via openable windows and dual aspect features for each unit.
- ✓ Lastly, this natural ventilation will be adopted with **extract fans in wet rooms** (toilets, bathroom, and kitchen) to remove the hot humid air.
- ✓ SAP Appendix P report has been included within the Appendix of this report which confirms that as per all the above measures the development can achieve "Medium" risk of overheating for each unit.

Given the all strategies above, the cooling demand and overheating risks have been reduced, and therefore higher energy consumption and CO₂ emissions due to active cooling systems can be avoided. Hence, the energy strategy report does not anticipate a need of any active cooling within each unit and the proposed Air Source Heat Pump system is only for space heating and hot water.

7.2. Active Design Measures

Heating and Hot Water System

The space heating and hot water are provided by energy efficient systems as summarised in the table below. At the 'BE LEAN' stage A high efficiency individual combi boiler (89.5% efficiency) have been examined for space heating and hot water demand in the residential unit. Detailed specifications used at BE LEAN stage are in the table below. All suggested specifications below are provisional at this early design stage, and therefore have to be reviewed with mechanical engineers and contractors in the course of design development.

Systems	General Specification		
Heating system	Gas condensing combi boiler for radiator heating (efficiency of 89.5% for residential)		
Cooling – Active Cooling Provided by electricity	None proposed for this scheme		
Hot water system	Same as space heating		

Table 19 Heating and Hot water systems

Please note that above systems have been used only for carbon emissions calculation at BE LEAN stage as per GLA Guidance on energy assessment. Suggested systems will be mentioned at BE GREEN stage as renewable technology (ASHPs) has been suggested – Section 9.2.

• High Efficiency Lighting

The proposed light fittings will be low energy efficient fittings. These can be **T5 fluorescent fittings with high frequency ballasts**, or **LED fittings for residential units**.

8. Energy Statement - BE CLEAN Stage

The Energy Hierarchy encourages the use of a CHP system and the connection to District Heating system to reduce CO₂ emissions further.

8.1. Decentralised Energy Network

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

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

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

ı



Figure 5 London Heat Map near the site

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

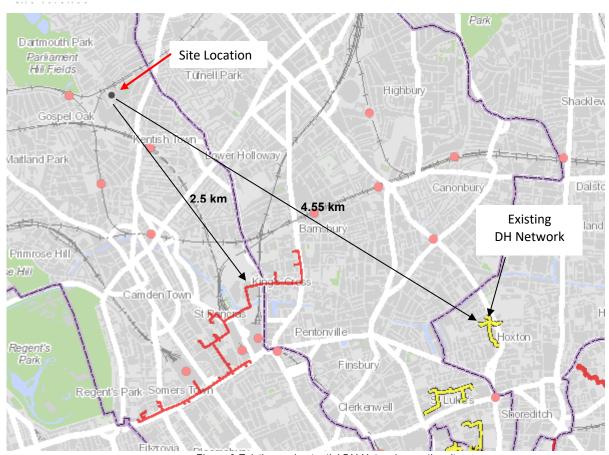


Figure 6 Existing and potential DH Network near the site

8.2. CHP

The Energy Hierarchy identifies the combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. Also, it encourages the creation of district heating systems supplied by CHP. The implementation of a CHP strategy should be decided according to good practice design. Key factors for the efficient implementation of the CHP system are:

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

To ensure that CHP is financially viable it is essential that the unit is selected to meet the base heat load and that this load is maintained over a large proportion of the day (a figure of 14 – 17 hours per day is often quoted subject to the load profiles and gas and electricity prices) to ensure that the additional costs (maintenance) associated with running a CHP unit can be recovered. This need to run the CHP plant, as far as possible continuously makes the building load profile of prime importance when reviewing the viability of such solutions and in particular the summer time heat load profile. To enable the CHP plant to run continuously when it is operating, a thermal store is often used so that excess CHP capacity can be used to generate hot water for use at a later time.

The feasibility of installing CHP has been assessed for this development. Since this development has only 6 residential unit that would not require high heating loads, installing the CHP system would not be beneficial given the cost. Moreover, the development does not have enough plant space for the CHP system. Hence a CHP system has not been considered for this development. Hence, no CO₂ reduction can be achieved at Be Clean stage.

9. Energy Statement - BE GREEN Stage

In this section the viable renewable energy technologies that could reduce the development's CO₂ emissions are examined. In determining the appropriate renewable technology for the site, the following factors were considered;

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

The table below summarises the various low zero carbon technologies considered for the projects, and we have identified that **Photovoltaic (PV)** would be the most appropriate option in this development.

Technology	Local Planning Requirements	Carbon Payback	Grants/ Funding	Feasibility
Air Source Heat Pumps (ASHP)	Noise Issues from External units	High	Renewable Heat Incentive (RHI)	HIGH
Photovoltaic (PV)	Spatial and Shadowing	High	Feed-in Tariff (FIT)	HIGH
Solar Thermal	Spatial and Shadowing	Low	Renewable Heat Incentive (RHI)	LOW
Ground Source Heat Pumps (GSHP)	Spatial issues for Bore Holes and noise	Medium	Renewable Heat Incentive (RHI)	LOW
Biomass	Spatial requirement for fuel storage and biomass odour	High	Renewable Heat Incentive (RHI)	LOW
Wind Power	Extensive planning requirements for noise and local biodiversity	Low	Feed-in Tariff (FIT)	LOW
Hydro Power	Extensive planning requirements for noise and water quality	None	Feed-in Tariff (FIT)	ZERO

Table 20 Feasibility Study of LZC Technologies

9.1. Non-feasible Technology

Ground Source Heat Pumps (GSHP)

Ground source heat pump would be a feasible option to meet the space heating requirements, however, it requires ground space for bore holes to extract the ground heat to be utilised for space heating requirements. In this case there is no available ground space for a borehole or trench system, the ground source loop would have to be incorporated within the foundation piles of the structure, which would result in additional cost. Hence, this option is not suitable for this development.

Solar Thermal

The use of solar thermal for this development would be limited to domestic hot water only. The use of solar thermal for space heating would not be practical as it is not required when solar thermal is at its most effective during the summer months. Therefore, this system would require additional plumbing and space for hot water storage, incurring additional financial cost. Moreover, the amount of carbon offset from the system is generally lower than other technologies. Therefore, this technology is deemed to be unsuitable for this development.

Hydro power

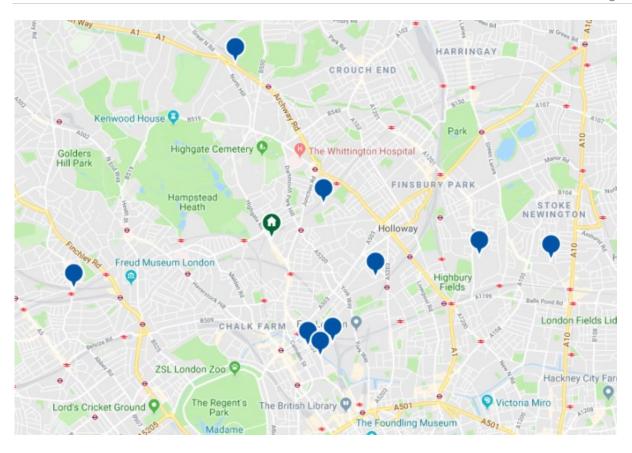
There is a river (river Thames) within the development site boundaries. However, small scale hydroelectric will not be studied any further because of the location and the spatial limitations of the development.

Biomass

A biomass system designed for this development would be fueled by wood pellets which have a high energy content. However, a biomass system would not be an appropriate technology for the site for the following reasons:

- i. The burning of wood pellets releases substantially more NOx emissions when compared to similar gas boilers. As the development is situated within an urban area, the installation of a biomass boiler would further impact on the air quality in this area.
- ii. the lack of spaces for pellet boiler and storage on the site.
- iii. Pellets would need to be transported from local pellet suppliers, which causes carbon emissions to the air.

However, if the biomass system is considered at detailed design stage, local suppliers can be found near the site as shown in the map below (http://biomass-suppliers-list.service.gov.uk).



Company name	Postcode	Contact	Fuel Supplied	Telephone
Travis Perkins Trading Co. Ltd	N19 5UN	www.travisperkins.co.uk toby.duncan@travisperkins.co.uk	Pellets	0207 561 0516
City Plumbing Suppliers (CPS) part of the Travis Perkins Group	N7 9HD	www.cityplumbing.co.uk shaun.jackson@cityplumbing.co.uk	Pellets	0207 6973480
Wolseley UK Ltd	NW1 OBY	www.plumbcenter.co.uk FFP.Camden@wolseley.co.uk	Pellets	0207 4240957
Wolseley UK Ltd	N1C 4PD	www.pipecenter.co.uk k94.kingscross@wolseley.co.uk	Pellets	0207 3804230
Travis Perkins Trading Co. Ltd	NW1 OPT	www.travisperkins.co.uk sean.mahon@travisperkins.co.uk	Pellets	0207 380 6480
Wolseley UK Ltd	N6 4JD	www.draincenter.co.uk qdn.Highgate@wolseley.co.uk	Pellets	0208 3400793
Travis Perkins Trading Co. Ltd	NW6 1SD	www.travisperkins.co.uk johnny.farmer@travisperkins.co.uk	Pellets	020 7794 8151
Wolseley UK Ltd	N5 2PW	www.plumbcenter.co.uk YM.Highbury@wolseley.co.uk	Pellets	02077041830
Travis Perkins Trading Co. Ltd	N16 8NU	www.travisperkins.co.uk kelly.thomson@travisperkins.co.uk	Pellets	020 7254 1200
Travis Perkins Trading Co. Ltd	W2 6NA	www.travisperkins.co.uk liam.clancy@travisperkins.co.uk	Pellets	020 7262 6602

Wind Power

Wind turbines need extensive planning requirements and they are only feasible at consistent wind speed. Moreover, since the development is located in an urban area, the site does not have sufficient wind speed to operate wind turbine at the height of 10 meters as shown below (http://www.renew-reuse-recycle.com/noabl.pl?n=503). Hence this option has been discounted.

Estimated average windspeeds around NW5 1..

Wind speed at 10m above ground level (m/s)								
5.5	5 5.2 5.1							
5.1	5.1 4.9 5							
5	4.9 4.8							

Wind speed at 25m above ground level (m/s)							
6.3	6.3 6 5.8						
6	5.7 5.7						
5.8	5.6 5.6						

Wind speed at 45m above ground level (m/s)							
6.7	6.7 6.5 6.3						
6.4	6.4 6.2 6.2						
6.3	6.1 6.1						

Squares surrounding the central square correspond to wind speeds for surrounding grid squares. Power generated is related to windspeed by a cubic ratio. That means if you halve the windspeed, the power goes down by a factor of 8 (which is $2 \times 2 \times 2$). A quarter of the windspeed gives you a 64^{th} of the power $(4 \times 4 \times 4)$. As a rough guide, if your turbine is rated at producing 1KW at 12m/s then it will produce 125W at 6m/s and 15W at 3m/s.

Please note! Bear in mind that the NOABL windspeed dataset used here is a model of windspeeds across the country, assuming completely flat terrain. It isn't a database of measured windspeeds. Other factors such as hills, houses, trees and other obstructions in your vicinity need to be considered as well as they can have a significant effect. If you're thinking about installing a wind turbine, you should perform your own windspeed measurements using an anemometer to determine what the actual figures are.

9.2. Proposed Technology

Air Source Heat Pumps

Air-source heat pumps (ASHPs) utilise thermal energy absorbed from surrounding air, boosting it into useable heat via an electrically-driven heat pump. The system comprises of an outdoor condenser unit and an indoor compressor unit, which then feeds the heating manifolds. ASHP efficiencies are measured by seasonal coefficients of performance (SCoPs), which are highly dependent on environmental temperature. The generated heat is typically used for space heating, serving radiators and underfloor heating at high SCoPs of up to 4.52, and for domestic hot water at SCoP 3.23. Because of the high SCoPs achievable, ASHPs result in lower carbon emissions than high-efficiency gas-fired condensing boilers. Although ASHPs have lower SCoPs than ground-source heat pumps (GSHPs), the installation costs are much lower as there is no need for ground loops or boreholes. Noise pollution from the external units is commonly cited as a planning issue, though this can be alleviated through thoughtful siting and attenuators.

For minimised installation costs and increased cost-effectiveness, a site-wide ASHP system has been considered to produce heating and hot water for individual dwelling.

• Photovoltaic (PV)

Based on the feasibility study above, PV would be the most suitable renewable Technology for the following reasons:

- i. The installation of PV is much simpler when compared to other renewable technologies
- ii. There is sufficient roof space available to install enough PV modules to have a significant impact on carbon emissions of the development
- iii. PV panels sited on the roof within an urban area are less visually intrusive when compared to wind turbines

The PV system capacity for the whole development depends upon the heating system selected. Therefore, the amount of PV relating to the proposed heating system option is outlined below:

Air Source Heat Pump + 5.67 kWp PV

The tables below illustrate the indicative PV panel's detail, should it be feasible to implement:

Orientation	South West	Number of Panels	18				
Panel Tilt	30°	30° Power Output					
Overshading	None or very little Type		Monocrystalline				
Proportion Exported	50%	PV Area	Approximate 29.7 m ²				
r roportion Exported	30 70	r v Alea	(18 panels * 1.65 m²)				
Annual Output	Approximate 4668.42 kWh						

Table 21 Suggested PV details

For the 5.67 kWp system,18 high efficiency 315W monocrystalline PV panels would to be installed at 30°. The area on the roof could be utilised for the PV panels and condenser units. For flat roofs as a rule of thumb, 400mm between rows of panels has been considered. The proposed PV panels are subject to further consideration at detailed design stage. In order to qualify both the installer and the equipment, the system must be certified under the Microgeneration Certification Scheme (MCS).

The Feed - In – Tariffs (FIT) were introduced in order to give an incentive for PV generated electricity. The FIT scheme is based on the principle that the energy supplier pays generation tariff for every kWh the PV system generates and an export tariff for every kWh of electricity supplied back to the national grid. The table below shows FIT payment rate from 1 April 2016 – 31 March 2019 (https://www.ofgem.gov.uk/publications-and-updates/feed-tariff-fit-generation-export-payment-rate-table-01-april-30-june-2016).

		2016/17			6/17 2017/18				2018/19				
		1 Apr– 30	1 Jul– 30 Sep	1 Oct– 31	1 Jan– 31Mar	1 Apr– 30	1 Jul– 30 Sep	1 Oct– 31	1 Jan– 31Mar	1 Apr– 30	1 Jul– 30 Sep	1 Oct– 31	1 Jan– 31Mar
- Colui	Higher	4.32	4.25	4.18	4.11	4.04	3.97	3.90	3.83	3.76	3.69	3.62	3.55
photovoltai c	Middle	3.89	3.83	3.76	3.70	3.64	3.57	3.51	3.45	3.38	3.32	3.26	3.20
(≤10kW)	Lower	0.74	0.68	0.63	0.58	0.52	0.47	0.41	0.37	0.32	0.26	0.21	0.15
Solar photovoltai	Higher	4.53	4.46	4.39	4.32	4.25	4.19	4.12	4.05	3.98	3.91	3.85	3.78
c	Middle	4.08	4.01	3.95	3.89	3.83	3.77	3.71	3.65	3.58	3.52	3.47	3.40
(>10kW & ≤50kW)	Lower	0.74	0.68	0.63	0.58	0.52	0.47	0.41	0.37	0.32	0.26	0.21	0.15
Solar photovoltai	Higher	2.38	2.32	2.26	2.21	2.15	2.10	2.04	1.98	1.93	1.87	1.82	1.76
c	Middle	2.14	2.09	2.03	1.99	1.94	1.89	1.84	1.78	1.74	1.68	1.64	1.58
(>50kW & ≤250kW)	Lower	0.74	0.68	0.63	0.58	0.52	0.47	0.41	0.37	0.32	0.26	0.21	0.15

Table 22 FIT Generation & Export Payment Rate Table (pence/kWh)

Given the proposed LZC technologies on the site (**PVs and Air Source Heat Pump**), the overall CO2 reduction at BE GREEN stage can be calculated as shown below. And, it can be seen that the overall CO_2 reduction via on-site renewables is $\underline{1.56\%}$ for the total emissions.

BE GREEN stage

	Regulated CO ₂ Emissions (kg CO ₂ /yr.)				
	BE LEAN	BE GREEN			
Unit 01	2579.17	2426.78			
Unit 02	2131.89	2127.59			
Unit 03	2140.68	2135.28			
Unit 04	2152.94	2144.21			
Unit 05	2152.53	2143.79			
Unit 06	2252.37	2223.02			
TOTAL	13409.58 13200.68				
Carbon Reduction	- 1.56%				

Table 23 Regulated Energy Use and Carbon Reduction at Be Green Stage

10. Conclusion

This report assesses the predicted energy performance and carbon dioxide emissions of the proposed development at 138-140 Highgate Road, Highgate, London, NW5 1PB, based on the information provided by the design team.

In line with the London Plan's three step energy hierarchy the regulated CO2 emissions for this development have been reduced by **23.56%** over Building Regulation 2013, once all measures in the table below are taken into account.

Stages	Strategies
BE LEAN Energy efficient design	 U-values and air permeability better than Building Regulations Part L. Accredited Construction Details for all junctions Natural ventilation with extract fans in wet rooms Low energy lights
BE CLEAN	
District heat networks or	N/A
communal heating systems	
BE GREEN	Individual Air Source Heat Pump for heating and hot
On-site renewable	water and PV panels of 5.67 kWp on the roof
technologies	(approximate 18 panels with 315 w/p are required).

Table 24 Energy Hierarchy and suggested strategies

The carbon savings from each stage can be calculated as shown below.

	Energy Hierarchy	Regulated Carbon Savings					
		Tonnes CO ₂ /yr	%				
BE LEAN	After energy demand reduction	3.86	22.35%				
BE CLEAN	After heat network/ CHP	0	0%				
BE GREEN	After renewable energy	0.21	1.56%				
Total Cum	ulative Savings	4.07	23.56%				
Total Targe	et Savings	3.28	19 %				

Table 25 Carbon dioxide Emissions after each stage of the Energy Hierarchy

The Energy Hierarchy

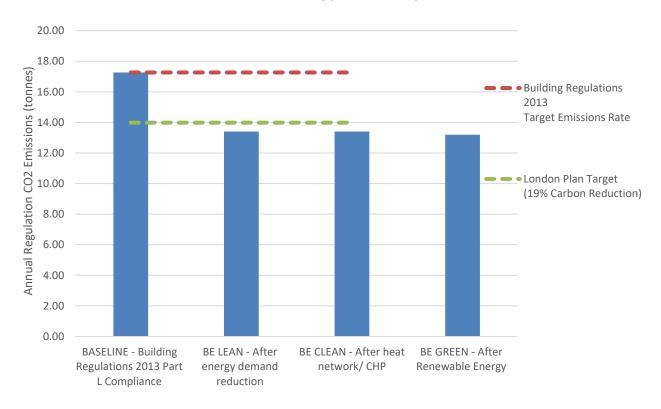


Figure 7 The Energy Hierarchy

11. Appendix A – SAP repots

II.I. Block Compliance

Block Compliance WorkSheet: Highgate Road 2

User Details

Assessor Name:Su LeeStroma Number:STR0031315Software Name:Stroma FSAPSoftware Version:Version: 1.0.4.16

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
Unit 01	21.34	29.28	61	70.6	113.72
Unit 02	19.81	25.48	49.8	56.6	107.4
Unit 03	19.74	25.41	49.8	56.5	108.17
Unit 04	19.65	25.33	49.6	56.5	109.12
Unit 05	19.63	25.31	49.6	56.5	109.21
Unit 06	21.21	27.91	54.9	64.1	104.81

Calculation Summary

Total Floor Area	652.43
Average TER	26.47
Average DER	20.23
Average DFEE	52.50
Average TFEE	60.20
Compliance	Pass
% Improvement DER TER	23.57
% Improvement DFEE TFEE	12.79

II.2. Baseline

		User Details:				
Assessor Name:	Su Lee	Stroma Nun	nber:	STRO	31315	
Software Name:	Stroma FSAP 2012	Software Ve	Version	ersion: 1.0.4.16		
	Pro	perty Address: Unit 0	1			
Address :	138-140 Highgate Road, High	igate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
Basement		Area(m²) 42.14 (1a) x	Av. Height(m)	(2a) =	113.78	(3a)
Ground floor		36.79 (1b) x	3.2	(2b) =	117.73	(3b)
First floor		34.79 (1c) x	4.65	(2c) =	161.77] (3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	113.72 (4)		L		_
Dwelling volume		(3a)+(3l	o)+(3c)+(3d)+(3e)+	(3n) =	393.28	(5)
2. Ventilation rate:				_		
	main secondary heating heating	other	total		m³ per hou	•
Number of chimneys		+ 0 =	0 x 4	0 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 2	0 =	0	(6b)
Number of intermittent fa	ns	[4 x 1	0 =	40	(7a)
Number of passive vents		[0 x 1	0 =	0	(7b)
Number of flueless gas fi	res	[0 x 4	0 =	0	(7c)
				Air cha	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	40 ÷	· (5) =	0.1	(8)
	een carried out or is intended, proceed to	to (17), otherwise continue	rom (9) to (16)	_		_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0 resent, use the value corresponding to the value corresponding to the correspon	•	ruction	L	0	(11)
deducting areas of openir		/ I N I		_		_
·	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		Ļ	0	(12)
If no draught lobby, en				Ļ	0	(13)
<u>-</u>	s and doors draught stripped	0.05 [0.0 (4.4)	4001	Ļ	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷		Ļ	0	(15)
Infiltration rate		(8) + (10) + (11) + (Ļ	0	(16)
•	q50, expressed in cubic metres		netre of envelope	area [5	(17)
•	ity value, then $(18) = [(17) \div 20] + (8)$,		, ia haina waad	L	0.35	(18)
Number of sides sheltere	es if a pressurisation test has been done	or a degree air permeability	is being used	Г	4	(19)
Shelter factor	eu .	(20) = 1 - [0.075 x (19)] =	-	0.92	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =		F	0.33	(21)
Infiltration rate modified for	_			L		」 ` ′
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (22a	a)m = ((22)m ÷	4										
<u> </u>	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltrati	ion rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	•				
0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.38		
Calculate effective		•	rate for t	he appli	cable ca	se							
If mechanical v			andiv N. (2	2h) _ (22a) v Emy (o	auation (N	JEN othou	nuico (22h	·) - (22a)			0	
If exhaust air heat									i) = (23a)		l	0	
a) If balanced		-		_					2h\m + (23h) ~ [1	 _ (23c)	0 1001	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	÷ 100j	(24a)
b) If balanced	mecha	ınical ve	entilation	without	heat rec	overv (N	I ∕IV) (24b)m = (2)	2b)m + (;	 23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole hou	use ext	ract ven	itilation c	or positiv	re input v	/entilatio	n from c	utside	!		I		
if (22b)m <				•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ve if (22b)m =									0.51				
	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(24d)
Effective air ch	nange i	rate - en	iter (24a	or (24b	o) or (240	c) or (24	d) in box	(25)					
	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(25)
3. Heat losses a	and he	at loss p	paramete	er:									
3. Heat losses a	and he Gros area	S	oaramete Openin m	gs	Net Ard		U-valı W/m2		A X U (W/i	<)	k-value kJ/m²-k		A X k kJ/K
	Gros	S	Openin	gs						<)			
ELEMENT	Gros area	S	Openin	gs	A ,n	n ² x	W/m2	K =	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	S	Openin	gs	A ,n	n ² x x x ¹ /	W/m2	= 0.04] =	(W/F	<) 			kJ/K (26)
ELEMENT Doors Windows Type 1	Gros area	S	Openin	gs	A ,n 2.46 2.78	x x x 1/	W/m2 1 /[1/(1.4)+	0.04] = 0.04] =	(W/H 2.46 3.69	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type 1 Windows Type 2	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97	n ²	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.46 3.69 3.94	<)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8	n ²	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	2.46 3.69 3.94 1.06	<)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78	x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	2.46 3.69 3.94 1.06 3.69	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22	x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	2.46 3.69 3.94 1.06 3.69 5.59	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/H 2.46 3.69 3.94 1.06 3.69 5.59 4.41	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92 3.83	x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55 5.08				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 6	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92 3.83 1.91466	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55 5.08	3 6			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 8	Gros area	S	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92 3.83 1.91460 0.64582	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/H 2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55 5.08 3.25482	3 6 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 2 Rooflights Type 3	Gros area	s (m²)	Openin	gs	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92 3.83 1.91460 0.64582 0.78298	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7	K	(W/N 2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55 5.08 3.25482 1.09789	3 6 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 8 Rooflights Type 8 Rooflights Type 8	Gros area	s (m²)	Openin	gs ²	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92 3.83 1.91460 0.64582 0.78298 42.14	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[K	(W/N 2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55 5.08 3.25482 1.09789 1.33107	3 6 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 8 Rooflights Type 8 Rooflights Type 6 Floor Walls Type 1	Gros area (s (m²)	Openin m	gs ²	A ,n 2.46 2.78 2.97 0.8 2.78 4.22 3.33 1.92 3.83 1.91460 0.64582 0.78298 42.14	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /	K	(W/N 2.46 3.69 3.94 1.06 3.69 5.59 4.41 2.55 5.08 3.25482 1.09789 1.33107 5.47819	3 6 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Walls Type5	14.63	0	14.63	x	0.18	=	2.63			(29)
Walls Type6	1.7	0	1.7	x	0.18	=	0.31			(29)
Walls Type7	13.5	0	13.5	x	0.18	=	2.43			(29)
Walls Type8	5.22	0	5.22	x	0.18	=	0.94			(29)
Walls Type9	5.76	2.78	2.98	x	0.18	=	0.54			(29)
Walls Type10	0.42	0	0.42	x	0.18	=	0.08			(29)
Walls Type11	6.18	0	6.18	x	0.18	=	1.11			(29)
Walls Type12	15.33	0	15.33	x	0.18	=	2.76			(29)
Walls Type13	2.02	0	2.02	x	0.18	=	0.36			(29)
Walls Type14	16	0	16	x	0.18	=	2.88			(29)
Walls Type15	11.53	3.83	7.7	x	0.18	=	1.39			(29)
Walls Type16	2	0	2	x	0.18	=	0.36			(29)
Walls Type17	9.63	2.46	7.17	x	0.18	=	1.29			(29)
Walls Type18	9.3	0	9.3	x	0.18	=	1.67			(29)
Walls Type19	0.6	0	0.6	x	0.18	_	0.11			(29)
Walls Type20	10.04	3.33	6.71	x	0.18	_	1.21			(29)
Walls Type21	5.77	0	5.77	x	0.18	_	1.04			(29)
Walls Type22	1.91	0	1.91	x	0.18	_	0.34			(29)
Walls Type23	17.21	0	17.21	x	0.18	=	3.1			(29)
Walls Type24	2.65	0	2.65	x	0.18	_	0.48			(29)
Walls Type25	16.14	0	16.14	x	0.18] =	2.91			(29)
Walls Type26	3.94	0	3.94	x	0.18	=	0.71			(29)
Walls Type27	9.7	4.22	5.48	x	0.18	_	0.99			(29)
Walls Type28	5.81	1.92	3.89	x	0.18	_	0.7			(29)
Roof Type1	33.58	2.56	31.02	x	0.13	_	4.03			(30)
Roof Type2	4.01	0.78	3.23	x	0.13	=	0.42			(30)
Total area of ele	ements, m ²		290.94			_				(31)
Party wall			27.41	x	0	=	0			(32)
Party wall			27.94	x	0	=	0			(32)
Party wall			40	x	0	=	0			(32)
		effective window U-v		using	formula 1/[(1	_ /U-val	ue)+0.04] as g	iven in paragraph	3.2	_
Fabric heat loss	s, W/K = S (A x	U)			(26)(30) +	(32) =		ſ	81.22	(33)
Heat capacity C	$sm = S(A \times k)$					((28).	(30) + (32) +	(32a)(32e) =	0	(34)
Thermal mass p	parameter (TMF	P = Cm ÷ TFA) i	n kJ/m²K			Indica	ative Value: Me	edium	250	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

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

if details of thermal bridging are not known (36) = $0.15 \times (31)$

Total fabric heat loss (33) + (36) =(37) 92.6

(38)m = $0.33 \times (25)$ m x (5)

Ventilation heat loss calculated monthly

Jan Feb Mar May Jun Jul Sep Oct Nov Dec Apr Aug

(36)

11.39

(38)m= 76.06	75.62	75.2	73.2	72.83	71.09	71.09	70.77	71.76	72.83	73.58	74.37		(38)
Heat transfer co	efficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 168.66	168.23	167.8	165.81	165.43	163.69	163.69	163.37	164.36	165.43	166.19	166.98		
Heat loss param	neter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) ₁ . (4)	12 /12=	165.8	(39)
(40)m= 1.48	1.48	1.48	1.46	1.45	1.44	1.44	1.44	1.45	1.45	1.46	1.47		
Number of days	in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.46	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heating	na ener	av reaui	rement:								kWh/ye	ar:	
Assumed occup if TFA > 13.9, if TFA £ 13.9,	N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		.84		(42)
Annual average	hot wa										1.54		(43)
Reduce the annual a	-				•	•	to achieve	a water us	se target o	f			
	Feb	Mar			_		Λιια	Son	Oot	Nov	Doo		
Jan Hot water usage in I			Apr ach month	May Vd,m = fa	Jun	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	107.63	103.57	99.51	95.45	91.39	91.39	95.45	99.51	103.57	107.63	111.69		
(1.7		.00.0.	00.01	001.10	000	000	300			m(44) ₁₁₂ =	└	1218.49	(44)
Energy content of he	ot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 165.64	144.87	149.49	130.33	125.06	107.91	100	114.75	116.12	135.33	147.72	160.41		
	t = 11		-f (t O :	havea (40		Total = Su	m(45) ₁₁₂ =	=	1597.63	(45)
If instantaneous wat		· ,	,		0 /·		` ′	, ,			T		(40)
(46)m= 24.85 Water storage Id	21.73 DSS:	22.42	19.55	18.76	16.19	15	17.21	17.42	20.3	22.16	24.06		(46)
Storage volume		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	ating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
Water storage lo		ا امسمام	ft-	ممامات	/1-\^//-	·/do\.							(40)
a) If manufactur				or is kno	wn (Kvvr	i/day):					.7		(48)
Temperature fac				oor			(49) v (40)				.54		(49)
Energy lost from b) If manufacture		-	-		or is not		(48) x (49)) =		0.	.92		(50)
Hot water storage			-								0		(51)
If community he	-		on 4.3										
Volume factor fr			O.L.							—	0		(52)
Temperature fac								(==) (\		0		(53)
Energy lost from Enter (50) or (5		_	, KVVN/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Water storage lo	, ,	•	or each	month			((56)m = (55) × (41)ı	m	0.	.92		(55)
	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(56)
(56)m= 28.48 If cylinder contains of												κH	(00)
	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(57)
(07)111- 20.40	20.10	20.40	21.31	20.40	21.31	20.40	20.40	21.31	20.40	21.31	20.40		(0.)

Primary circuit loss (annual) from Table 3	0	(58)											
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	-1-1)												
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26	 	(59)											
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26	(39)											
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		1											
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)											
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m											
(62)m= 217.39 191.61 201.24 180.41 176.8 157.99 151.74 166.5 166.2 187.07	197.8 212.16	(62)											
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)													
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													
(63)m= 0 0 0 0 0 0 0 0 0 0 0													
Output from water heater													
(64)m= 217.39 191.61 201.24 180.41 176.8 157.99 151.74 166.5 166.2 187.07	197.8 212.16												
Output from water heater	r (annual) ₁₁₂	2206.91 (64)											
Heat gains from water heating, kWh/month 0.25 $^{'}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m	+ (57)m + (59)m]											
(65)m= 96.47 85.56 91.1 83.4 82.98 75.94 74.65 79.55 78.67 86.39	89.18 94.73	(65)											
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is fr	om community h	eating											
5. Internal gains (see Table 5 and 5a):													
Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec												
(66)m= 141.77 141.77 141.77 141.77 141.77 141.77 141.77 141.77 141.77 141.77	141.77 141.77	(66)											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		I											
(67)m= 24.68 21.92 17.82 13.49 10.09 8.52 9.2 11.96 16.05 20.38	23.79 25.36	(67)											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	l l	I											
(68)m= 276.8 279.67 272.43 257.02 237.57 219.29 207.08 204.2 211.44 226.85	246.3 264.58	(68)											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	L L	l											
(69)m= 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18	37.18 37.18	(69)											
Pumps and fans gains (Table 5a)		ł											
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3	(70)											
Losses e.g. evaporation (negative values) (Table 5)		` '											
(71)m= -113.42	-113.42 -113.42	(71)											
Water heating gains (Table 5)	1	` '											
(72)m= 129.67 127.32 122.45 115.83 111.53 105.48 100.33 106.92 109.27 116.12	123.86 127.33	(72)											
	ļ	(/											
		(73)											
(73)m= 499.67 497.44 481.24 454.88 427.72 401.81 385.14 391.62 405.29 431.89 6. Solar gains:	462.48 485.81	(73)											
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicab	ale orientation												
Orientation: Access Factor Area Flux g_	FF	Gains											
<u> </u>	able 6c	(W)											
Northeast 0.9x 0.77 x 4.22 x 11.28 x 0.63 x	0.7 =	14.55 (75)											
Northeast 0.9x	0.7 =	13.21 (75)											
0.77	0.1	10.21											

N. a		,		1		1		1		1		_
Northeast _{0.9x}	0.77	X	4.22	Х	22.97	X	0.63	X	0.7	=	29.62	(75)
Northeast _{0.9x}	0.77	X	3.83	X	22.97	X	0.63	X	0.7	=	26.88	(75)
Northeast _{0.9x}	0.77	X	4.22	X	41.38	X	0.63	X	0.7	=	53.37	(75)
Northeast _{0.9x}	0.77	X	3.83	X	41.38	X	0.63	X	0.7	=	48.43	(75)
Northeast _{0.9x}	0.77	X	4.22	X	67.96	X	0.63	X	0.7	=	87.64	(75)
Northeast _{0.9x}	0.77	X	3.83	X	67.96	X	0.63	X	0.7	=	79.54	(75)
Northeast 0.9x	0.77	X	4.22	X	91.35	X	0.63	X	0.7	=	117.81	(75)
Northeast _{0.9x}	0.77	X	3.83	X	91.35	X	0.63	X	0.7	=	106.92	(75)
Northeast _{0.9x}	0.77	X	4.22	X	97.38	X	0.63	X	0.7	=	125.6	(75)
Northeast 0.9x	0.77	X	3.83	x	97.38	X	0.63	X	0.7	=	113.99	(75)
Northeast 0.9x	0.77	X	4.22	X	91.1	X	0.63	X	0.7	=	117.49	(75)
Northeast 0.9x	0.77	X	3.83	X	91.1	X	0.63	X	0.7	=	106.63	(75)
Northeast 0.9x	0.77	X	4.22	x	72.63	x	0.63	x	0.7	=	93.67	(75)
Northeast _{0.9x}	0.77	X	3.83	x	72.63	X	0.63	x	0.7	=	85.01	(75)
Northeast _{0.9x}	0.77	X	4.22	x	50.42	X	0.63	X	0.7	=	65.03	(75)
Northeast _{0.9x}	0.77	X	3.83	x	50.42	X	0.63	x	0.7	=	59.02	(75)
Northeast _{0.9x}	0.77	X	4.22	x	28.07	X	0.63	X	0.7	=	36.2	(75)
Northeast _{0.9x}	0.77	X	3.83	x	28.07	X	0.63	X	0.7	=	32.85	(75)
Northeast _{0.9x}	0.77	X	4.22	x	14.2	X	0.63	X	0.7	=	18.31	(75)
Northeast _{0.9x}	0.77	X	3.83	x	14.2	X	0.63	X	0.7	=	16.62	(75)
Northeast _{0.9x}	0.77	X	4.22	х	9.21	X	0.63	x	0.7	=	11.88	(75)
Northeast _{0.9x}	0.77	X	3.83	x	9.21	x	0.63	x	0.7] =	10.79	(75)
Southwest _{0.9x}	0.77	X	2.78	x	36.79		0.63	x	0.7	=	31.26	(79)
Southwest _{0.9x}	0.77	X	2.97	x	36.79		0.63	x	0.7] =	33.4	(79)
Southwest _{0.9x}	0.77	X	2.78	x	36.79		0.63	x	0.7] =	31.26	(79)
Southwest _{0.9x}	0.77	x	3.33	x	36.79		0.63	x	0.7] =	37.44	(79)
Southwest _{0.9x}	0.77	X	2.78	x	62.67		0.63	x	0.7] =	53.25	(79)
Southwest _{0.9x}	0.77	X	2.97	x	62.67	Ì	0.63	x	0.7] =	56.89	(79)
Southwest _{0.9x}	0.77	X	2.78	x	62.67	ĺ	0.63	x	0.7] =	53.25	(79)
Southwest _{0.9x}	0.77	X	3.33	x	62.67		0.63	x	0.7] =	63.78	(79)
Southwest _{0.9x}	0.77	x	2.78	x	85.75	Ì	0.63	x	0.7] =	72.86	(79)
Southwest _{0.9x}	0.77	X	2.97	x	85.75	ĺ	0.63	x	0.7] =	77.84	(79)
Southwest _{0.9x}	0.77	X	2.78	x	85.75	ĺ	0.63	x	0.7] =	72.86	(79)
Southwest _{0.9x}	0.77	x	3.33	x	85.75	Ì	0.63	x	0.7] =	87.27	(79)
Southwest _{0.9x}	0.77	X	2.78	x	106.25	ĺ	0.63	x	0.7] =	90.27	(79)
Southwest _{0.9x}	0.77	X	2.97	x	106.25	ĺ	0.63	x	0.7] =	96.44	(79)
Southwest _{0.9x}	0.77	x	2.78	x	106.25	ĺ	0.63	x	0.7] =	90.27	(79)
Southwest _{0.9x}	0.77	x	3.33	x	106.25	Ī	0.63	x	0.7	j =	108.13	(79)
Southwest _{0.9x}	0.77	x	2.78	x	119.01	Ī	0.63	x	0.7] =	101.11	(79)
Southwest _{0.9x}	0.77	X	2.97	x	119.01	Ī	0.63	x	0.7	=	108.02	(79)
Southwest _{0.9x}	0.77	X	2.78	x	119.01	j	0.63	x	0.7	=	101.11	(79)
_		-		•		•		•		•		_

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Southwest _{0.9x}	0.77	X	3.33	Х	119.01		0.63	X	0.7	=	121.12	(79)
Southwest _{0.9x}	0.77	X	2.78	X	118.15		0.63	X	0.7	=	100.38	(79)
Southwest _{0.9x}	0.77	X	2.97	X	118.15		0.63	X	0.7	=	107.24	(79)
Southwest _{0.9x}	0.77	X	2.78	Х	118.15		0.63	X	0.7	=	100.38	(79)
Southwest _{0.9x}	0.77	X	3.33	X	118.15		0.63	X	0.7	=	120.24	(79)
Southwest _{0.9x}	0.77	X	2.78	X	113.91		0.63	X	0.7	=	96.78	(79)
Southwest _{0.9x}	0.77	X	2.97	X	113.91		0.63	X	0.7	=	103.39	(79)
Southwest _{0.9x}	0.77	X	2.78	X	113.91		0.63	X	0.7	=	96.78	(79)
Southwest _{0.9x}	0.77	X	3.33	X	113.91		0.63	X	0.7	=	115.92	(79)
Southwest _{0.9x}	0.77	X	2.78	x	104.39		0.63	X	0.7	=	88.69	(79)
Southwest _{0.9x}	0.77	x	2.97	X	104.39		0.63	X	0.7	=	94.75	(79)
Southwest _{0.9x}	0.77	x	2.78	x	104.39		0.63	X	0.7	=	88.69	(79)
Southwest _{0.9x}	0.77	x	3.33	x	104.39		0.63	X	0.7	=	106.24	(79)
Southwest _{0.9x}	0.77	x	2.78	x	92.85		0.63	X	0.7	=	78.89	(79)
Southwest _{0.9x}	0.77	x	2.97	x	92.85		0.63	X	0.7	=	84.28	(79)
Southwest _{0.9x}	0.77	x	2.78	x	92.85		0.63	x	0.7] =	78.89	(79)
Southwest _{0.9x}	0.77	x	3.33	x	92.85		0.63	x	0.7] =	94.49	(79)
Southwest _{0.9x}	0.77	x	2.78	x	69.27		0.63	x	0.7] =	58.85	(79)
Southwest _{0.9x}	0.77	x	2.97	x	69.27		0.63	x	0.7] =	62.87	(79)
Southwest _{0.9x}	0.77	x	2.78	x	69.27		0.63	x	0.7] =	58.85	(79)
Southwest _{0.9x}	0.77	x	3.33	x	69.27		0.63	x	0.7	j =	70.49	(79)
Southwest _{0.9x}	0.77	x	2.78	x	44.07		0.63	x	0.7] =	37.44	(79)
Southwest _{0.9x}	0.77	x	2.97	x	44.07		0.63	x	0.7	j =	40	(79)
Southwest _{0.9x}	0.77	x	2.78	x	44.07		0.63	x	0.7	j =	37.44	(79)
Southwest _{0.9x}	0.77	х	3.33	х	44.07		0.63	x	0.7	j =	44.85	(79)
Southwest _{0.9x}	0.77	x	2.78	x	31.49		0.63	x	0.7	j =	26.75	(79)
Southwest _{0.9x}	0.77	x	2.97	x	31.49		0.63	x	0.7	j =	28.58	(79)
Southwest _{0.9x}	0.77	х	2.78	х	31.49		0.63	x	0.7	j =	26.75	(79)
Southwest _{0.9x}	0.77	х	3.33	х	31.49		0.63	x	0.7	j =	32.04	(79)
Northwest 0.9x	0.77	х	0.8	х	11.28	x	0.63	x	0.7	j =	2.76	(81)
Northwest 0.9x	0.77	x	1.92	x	11.28	х	0.63	X	0.7	j =	6.62	(81)
Northwest _{0.9x}	0.77	х	0.8	x	22.97	x	0.63	X	0.7	j =	5.62	(81)
Northwest 0.9x	0.77	x	1.92	x	22.97	x	0.63	X	0.7	j =	13.48	(81)
Northwest _{0.9x}	0.77	x	0.8	x	41.38	x	0.63	X	0.7	j =	10.12	(81)
Northwest _{0.9x}	0.77	x	1.92	x	41.38	x	0.63	X	0.7	j =	24.28	(81)
Northwest 0.9x	0.77	x	0.8	x	67.96	x	0.63	x	0.7	=	16.61	(81)
Northwest 0.9x	0.77	x	1.92	x	67.96	x	0.63	x	0.7	=	39.87	(81)
Northwest 0.9x	0.77	x	0.8	×	91.35	x	0.63	x	0.7	=	22.33	(81)
Northwest _{0.9x}	0.77	X	1.92	X	91.35	x	0.63	x	0.7	, =	53.6	(81)
Northwest _{0.9x}	0.77	X	0.8	x	97.38	x	0.63	x	0.7] =	23.81	(81)
Northwest _{0.9x}	0.77	x	1.92	X	97.38	x	0.63	x	0.7] =	57.14	(81)
L	<u> </u>	1		ı		ı			-	1		_ ′

Northwest _{0.9x}	0.77) x	0.8	x	91.1] _x	0.63	X	0.7	1 =	22.27	(81)
Northwest 0.9x	0.77] ^] x	1.92	^ x	91.1] ^] _x	0.63	X	0.7] -] =	53.46	(81)
Northwest 0.9x	0.77] ^] x	0.8	^ x	72.63] ^] x	0.63	X	0.7] -] =	17.76	(81)
Northwest _{0.9x}	0.77]	1.92	l ^ l x	72.63] ^] x	0.63	x	0.7] =	42.62	(81)
Northwest _{0.9x}	0.77]	0.8	l x	50.42] ^] _x	0.63	X	0.7]] =	12.33	(81)
Northwest _{0.9x}	0.77]	1.92	l ^	50.42] ^] _x	0.63	x	0.7]	29.59	(81)
Northwest 0.9x	0.77] x	0.8	X	28.07] x	0.63	x	0.7]] =	6.86	(81)
Northwest _{0.9x}	0.77]]	1.92	X	28.07]]	0.63	X	0.7]] =	16.47	(81)
Northwest _{0.9x}	0.77	X	0.8	X	14.2) x	0.63	X	0.7] =	3.47	(81)
Northwest 0.9x	0.77	X	1.92	X	14.2	x	0.63	x	0.7) =	8.33	(81)
Northwest _{0.9x}	0.77	X	0.8	х	9.21	x	0.63	x	0.7	=	2.25	(81)
Northwest _{0.9x}	0.77	X	1.92	x	9.21	X	0.63	x	0.7	=	5.41	(81)
Rooflights _{0.9x}	1	X	1.91	x	26	x	0.63	x	0.7	j =	19.76	(82)
Rooflights _{0.9x}	1	x	0.65	х	26	x	0.63	x	0.7	j =	6.66	(82)
Rooflights 0.9x	1	x	0.78	x	26	x	0.63	x	0.7	=	8.08	(82)
Rooflights 0.9x	1	x	1.91	x	54	x	0.63	x	0.7] =	41.03	(82)
Rooflights _{0.9x}	1	x	0.65	x	54	x	0.63	x	0.7] =	13.84	(82)
Rooflights _{0.9x}	1	X	0.78	х	54	x	0.63	x	0.7	=	16.78	(82)
Rooflights _{0.9x}	1	X	1.91	x	96	x	0.63	x	0.7	=	72.95	(82)
Rooflights _{0.9x}	1	X	0.65	x	96	x	0.63	x	0.7	=	24.61	(82)
Rooflights _{0.9x}	1	X	0.78	X	96	x	0.63	x	0.7	=	29.83	(82)
Rooflights _{0.9x}	1	X	1.91	X	150	x	0.63	x	0.7	=	113.99	(82)
Rooflights 0.9x	1	X	0.65	X	150	X	0.63	X	0.7	=	38.45	(82)
Rooflights _{0.9x}	1	X	0.78	x	150	x	0.63	x	0.7	=	46.62	(82)
Rooflights _{0.9x}	1	X	1.91	X	192	x	0.63	X	0.7	=	145.9	(82)
Rooflights _{0.9x}	1	X	0.65	X	192	x	0.63	X	0.7	=	49.21	(82)
Rooflights _{0.9x}	1	X	0.78	x	192	x	0.63	X	0.7	=	59.67	(82)
Rooflights _{0.9x}	1	X	1.91	x	200	X	0.63	X	0.7	=	151.98	(82)
Rooflights _{0.9x}	1	X	0.65	X	200	X	0.63	X	0.7	=	51.27	(82)
Rooflights 0.9x	1	X	0.78	X	200	X	0.63	X	0.7	=	62.15	(82)
Rooflights 0.9x	1	X	1.91	X	189	X	0.63	X	0.7	=	143.62	(82)
Rooflights 0.9x	1	X	0.65	X	189	X	0.63	X	0.7	=	48.45	(82)
Rooflights 0.9x	1	X	0.78	Х	189	X	0.63	X	0.7	=	58.74	(82)
Rooflights 0.9x	1	X	1.91	X	157	X	0.63	X	0.7	=	119.31	(82)
Rooflights 0.9x	1	X	0.65	Х	157	X	0.63	X	0.7	=	40.24	(82)
Rooflights 0.9x	1	X	0.78	Х	157	X	0.63	X	0.7	=	48.79	(82)
Rooflights 0.9x	1	X	1.91	X	115	X	0.63	X	0.7	=	87.39	(82)
Rooflights 0.9x	1	X	0.65	X	115	X	0.63	X	0.7	=	29.48	(82)
Rooflights 0.9x	1	X	0.78	X	115	X	0.63	X	0.7	=	35.74	(82)
Rooflights 0.9x	1	X	1.91	X	66	X	0.63	X	0.7] = 1	50.15	(82)
Rooflights _{0.9x}	1	X	0.65	X	66	X	0.63	X	0.7] =	16.92	(82)

Rooflights _{0.9x} 1	X	0.7	8	x	66	X		0.63	x [0.7	=	20.51	(82)
Rooflights _{0.9x} 1	X	1.9	1	x	33	X		0.63	x [0.7	=	25.08	(82)
Rooflights 0.9x 1	X	0.6	5	x	33	X		0.63	x	0.7	=	8.46	(82)
Rooflights _{0.9x} 1	X	0.7	8	x	33	X		0.63	x [0.7	=	10.26	(82)
Rooflights _{0.9x} 1	Х	1.9	1	x	21	X		0.63	x	0.7	=	15.96	(82)
Rooflights 0.9x 1	Х	0.6	5	x	21	X		0.63	x	0.7	=	5.38	(82)
Rooflights 0.9x 1	Х	0.7	8	x	21	X		0.63	x [0.7	=	6.53	(82)
						_							
Solar gains in watts, ca	alculated	for eacl	n month			(83)m	n = Si	um(74)m .	(82)m	_		•	
(83)m= 205 374.42	574.4	807.84	986.81	1014.		825	5.76	655.11	431.03	250.26	172.33		(83)
Total gains – internal a			. ,	<u> </u>						,		1	
(84)m= 704.67 871.86	1055.64	1262.72	1414.53	1415.9	9 1348.67	121	7.38	1060.4	862.91	712.74	658.13		(84)
7. Mean internal temp	perature	(heating	season)									
Temperature during h	neating p	eriods ir	the livi	ng are	a from Ta	ble 9	, Th	1 (°C)				21	(85)
Utilisation factor for g	ains for I	iving are	a, h1,m	(see	Table 9a)								_
Jan Feb	Mar	Apr	May	Jur	Jul	А	ug	Sep	Oct	Nov	Dec		
(86)m= 1 0.99	0.98	0.94	0.84	0.67	0.52	0.5	58	0.83	0.97	0.99	1		(86)
Mean internal temper	ature in	living are	ea T1 (fo	ollow s	teps 3 to	7 in T	Γable	e 9c)					
(87)m= 19.35 19.56	19.91	20.36	20.73	20.92	20.98	20.	.97	20.8	20.31	19.75	19.32		(87)
Temperature during h	neating p	eriods ir	rest of	dwelli	na from Ta	able 9	 9 Th	12 (°C)		•	•	•	
(88)m= 19.7 19.7	19.71	19.72	19.72	19.73	<u> </u>	19.		19.73	19.72	19.72	19.71		(88)
	oina far i	oot of d	uollin a	h2 m /	ooo Toblo	. 00)				!			
Utilisation factor for g $ \begin{array}{c c} (89)m = & 1 & 0.99 \end{array} $	0.98	0.92	0.78	0.56	0.38	9a) 0.4	14	0.75	0.96	0.99	1		(89)
	<u> </u>			ļ	<u> </u>					0.00	'		()
Mean internal temper	r			-	`	i 				T 40.40	1 47 5	[(00)
(90)m= 17.54 17.85	18.35	18.99	19.47	19.69	19.73	19.	.72	19.58	18.94	18.13	17.5		(90)
								'	LA = LIVII	ng area ÷ (4	4) =	0.33	(91)
Mean internal temper				~~		- `				,	,	l	
(92)m= 18.14 18.41	18.87	19.44	19.88	20.1	20.14		.13	19.98	19.39	18.66	18.1		(92)
Apply adjustment to t	1			1	T T	1			·	T 40.00	10.4		(02)
(93)m= 18.14 18.41	18.87	19.44	19.88	20.1	20.14	20.	.13	19.98	19.39	18.66	18.1		(93)
8. Space heating requ			b t - ! -		-t 11 -f	Tabl	ام ۸	4	4 T:	(70)	d == ==l=	v data	
Set Ti to the mean int the utilisation factor for				ied at	step 11 of	rabi	ie 9t	o, so tha	t 11,m=	(76)m an	a re-caid	culate	
Jan Feb	Mar	Apr	May	Jur	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation factor for g	ains, hm	:				!		•					
(94)m= 0.99 0.99	0.97	0.91	0.79	0.6	0.42	0.4	49	0.77	0.95	0.99	1		(94)
Useful gains, hmGm	, W = (94	1)m x (84	1)m										
(95)m= 701.13 861.51	1022.97	1152.02	1115.84	846.0	8 570.1	593	3.17	815.29	820.54	705.51	655.62		(95)
Monthly average exte	rnal tem	perature	from Ta	able 8								ı	
(96)m= 4.3 4.9	6.5	8.9	11.7	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
Heat loss rate for me							_	· ,		1,,		l	(07)
(97)m= 2333.97 2273.51	2075.03		1353.51	899.5		610		966.98	1454.28	ļ	2321.37		(97)
Space heating require							- `	,	<u> </u>	 	1220.20		
(98)m= 1214.83 948.86	782.73	429.32	176.83	0	0		,	0	471.5	875.48	1239.32		

					T-4-		(1.) (1.)	m) C (6)O)	6138.87	(98)
		0.1			1018	ıı per year	(kWh/yea	r) = Sum(s	10) _{15,912} =	<u> </u>	= ` ` `
Space heating requiremen		•								53.98	(99)
9a. Energy requirements –	Individual h	neating s	ystems i	including	micro-C	CHP)					
Space heating: Fraction of space heat from	m seconda	rv/supple	ementary	/ svstem						0	(201)
Fraction of space heat from			momary	•	(202) = 1	- (201) =				1	(202)
Fraction of total heating from	•	, ,			(204) = (2		(203)] =			1	(204)
Efficiency of main space h	•				, , ,	, .	` /2			93.5	(206)
Efficiency of secondary/su	• •		a systen	n, %						0	(208)
	ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	`
Space heating requiremen		<u> </u>		<u> </u>	_ //ug	ССР	1 000	1407	_ <u></u>	10001090	Jui
1214.83 948.86 782		176.83	0	0	0	0	471.5	875.48	1239.32		
(211) m = {[(98)m x (204)] }	x 100 ÷ (2	06)								ı	(211)
1299.28 1014.82 837	.15 459.16	189.12	0	0	0	0	504.28	936.35	1325.48		
					Tota	al (kWh/ye	ar) =Sum(211) _{15,101}	2=	6565.64	(211)
Space heating fuel (secon	• •	/month									
$= \{[(98)m \times (201)]\} \times 100 \div$		Ι ,	Ι ,	Ι ο	I 0	0	Ιο	Ιο		1	
(215)m= 0 0 0	0	0	0	0	0 Tota		ar) =Sum(0	0	(215)
Water heating					1010	(ar) – o arri(i	L 10/ _{15,101}	2	0	(213)
Output from water heater (c	calculated a	above)									
217.39 191.61 201		176.8	157.99	151.74	166.5	166.2	187.07	197.8	212.16		
Efficiency of water heater	-									79.8	(216)
(217)m= 88.69 88.51 88.	08 87.05	84.81	79.8	79.8	79.8	79.8	87.18	88.32	88.76		(217)
Fuel for water heating, kWh											
(219) m = (64) m x $100 \div (2)$ (219)m = 245.1 216.49 228		208.46	197.98	190.16	208.64	208.27	214.58	223.96	239.03		
I			•	•	Tota	ıl = Sum(2	19a) ₁₁₂ =		•	2588.39	(219)
Annual totals							k	Wh/yea	r	kWh/yea	<u></u>
Space heating fuel used, m	ain system	1								6565.64	
Water heating fuel used										2588.39	
Electricity for pumps, fans a	and electric	keep-ho	ot								
central heating pump:									30		(230c)
boiler with a fan-assisted f	lue								45		(230e)
Total electricity for the above	/e, kWh/ye	ar			sum	of (230a)	(230g) =	:		75	(231)
Electricity for lighting	•									435.8	(232)
12a. CO2 emissions – Ind	ividual h <u>ea</u>	ting syste	ems <u>inçl</u>	udin <u>g mi</u>	cro- <u>CH</u> F)					
		<u> </u>	En	iergy Vh/year			Emiss kg CO	ion fac	tor	Emission kg CO2/ye	
Space heating (main syster	m 1)			1) x					=		_
Space nealing (main system	11 1)		(21	., ^			0.2	16	_	1418.18	(261)

Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	559.09 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1977.27 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	226.18 (268)
Total CO2, kg/year	sum	of (265)(271) =	2242.37 (272)

TER = 29.28 (273)

		User Details:				
Assessor Name:	Su Lee	Stroma Num	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Version	n: 1.0.4.16	
	Pro	perty Address: Unit 02	2			
Address :	138-140 Highgate Road, High	gate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:					
Basement		Area(m²) 39.95 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)
Ground floor		35.19 (1b) x	3.2	(2b) =	112.61	(3b)
First floor		32.26 (1c) x	4.65	(2c) =	150.01	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	107.4 (4)		l L		_
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	(3n) =	370.48	(5)
2. Ventilation rate:				_		
	main secondary heating heating	other	total		m³ per hour	•
Number of chimneys		+ 0 =	0 x 4	0 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 2	20 =	0	(6b)
Number of intermittent fa	ns		4 x 1	0 =	40	(7a)
Number of passive vents			0 x 1	0 =	0	(7b)
Number of flueless gas fi	res		0 x 4	0 =	0	(7c)
				Air cha	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	40 ÷	÷ (5) =	0.11	(8)
	een carried out or is intended, proceed	to (17), otherwise continue f	rom (9) to (16)	_		_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0	•	ruction		0	(11)
deducting areas of openir	resent, use the value corresponding to t ngs); if equal user 0.35	ne greater wall area (after				
=	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0			0	(12)
If no draught lobby, en	ter 0.05, else enter 0			Ī	0	(13)
Percentage of windows	s and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	Ī	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square m	netre of envelope	area	5	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$	otherwise (18) = (16)		Ī	0.36	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used	_		_
Number of sides sheltere	ed				2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =	Ĺ	0.85	(20)
Infiltration rate incorporat	_	$(21) = (18) \times (20) =$			0.3	(21)
Infiltration rate modified f	or monthly wind speed	, ,	, , , , , , , , , , , , , , , , , , , 			
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (22	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
A .I'	· · · · · · · · · · · · · · · · · · ·	- /-11-	(-11	.1		(04 -)	(00 -)					
Adjusted infiltra	0.38	e (allowi	ng for sr 0.33	0.33	a wina s	0.29	(21a) X 0.28	(22a)m 0.3	0.33	0.34	0.36		
Calculate effect							0.20	0.5	0.33	0.34	0.30		
If mechanical	l ventila	tion:										0	(23a)
If exhaust air hea	at pump ι	using Appe	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with I	heat reco	very: effic	iency in %	allowing for	or in-use fa	actor (from	n Table 4h) =				0	(23c)
a) If balanced						- ` ` 	- ` ` - 	ŕ	, 	- 	``	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced			ı				r ``	í `	 	<u> </u>	i -		<i>4</i> = 44 \$
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				-					E (22h	. \			
if (22b)m (24c)m= 0	< 0.5 x	(23b), t	nen (240	0 = (230); otnerv	wise (24)	C) = (220)	0) m + 0	.5 × (230	0	0		(24c)
(''						<u> </u>					U		(240)
d) If natural v									0.5]				
(24d)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air c	change	rate - er	nter (24a	or (24b	o) or (240	c) or (24	d) in box	· (25)	!	!			
(25)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
Heat losses	and he	at loss r	paramete	er:									
3. Heat losses ELEMENT	and he Gros area	ss	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	Gros	ss	Openin	gs		n²				K)			
ELEMENT	Gros area	ss	Openin	gs	A ,n	m² x	W/m2	= =	(W/I	K)			kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I 2.46	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	ss	Openin	gs	A ,n 2.46 3.18	m ² x x1/2 x1/2	W/m2 1 /[1/(1.4)+	0.04] = 0.04] =	(W/I 2.46 4.22	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	ss	Openin	gs	A ,n 2.46 3.18 3.41	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.46 4.22 4.52	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92	m ²	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.46 4.22 4.52 1.22	K)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 2.46 4.22 4.52 1.22 4.22	K)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18 3.46	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.22 4.52 1.22 4.22 4.59	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type	Gros area 1 2 3 4 5 6 7	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22				kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type	Gros area 1 2 3 4 5 6 7	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 2.20658	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 2 1	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 0.73988	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) +	0.04] = 0.04]	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 2 1	ss	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 3.46 0.73988 0.64166	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	0.04] = 0.04]	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780 1.09083	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 9 1 9 2 9 3	ss (m²)	Openin	gs	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 0.73988 0.64166 39.95	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780 1.09083 5.1935	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	ss (m²)	Openin m	gs ²	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 3.46 2.20659 0.73988 0.64166 39.95	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	0.04] = 0.04]	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780 1.09083 5.1935	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	9 9	Openin m	gs ²	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 3.46 2.20659 0.73988 0.64166 39.95 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780 1.09083 5.1935 0.35	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 9 1 10.2 5.1 1.38	9 5	0 3.18 0.92	gs ²	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 3.46 2.20658 0.73988 0.64166 39.95 10.29 1.92 0.43	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18	K	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780 1.09083 5.1935 1.85 0.35	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	9 5	Openin m	gs ²	A ,n 2.46 3.18 3.41 0.92 3.18 3.46 3.18 3.46 2.20659 0.73988 0.64166 39.95 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.22 4.52 1.22 4.22 4.59 4.22 4.59 3.75114 1.25780 1.09083 5.1935 0.35	9			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8 ×	0.18 =	0.14			(29)
Walls Type7 0.96 0	0.96 ×	0.18 =	0.17			(29)
Walls Type8 5.63 0	5.63 ×	0.18 =	1.01			(29)
Walls Type9 4.96 0	4.96 ×	0.18 =	0.89			(29)
Walls Type10 5.76 3.18	2.58 ×	0.18 =	0.46			(29)
Walls Type11 0.42 0	0.42 ×	0.18 =	0.08			(29)
Walls Type12 6.4 0	6.4 ×	0.18 =	1.15			(29)
Walls Type13 9.11 3.46	5.65 ×	0.18 =	1.02			(29)
Walls Type14 1.86 0	1.86 ×	0.18 =	0.33			(29)
Walls Type15 8.6 2.46	6.14 X	0.18 =	1.11			(29)
Walls Type16 9.3 0	9.3 x	0.18 =	1.67			(29)
Walls Type17 0.6 0	0.6 ×	0.18 =	0.11			(29)
Walls Type18 8.37 3.18	5.19 x	0.18 =	0.93			(29)
Roof Type1 31.76 2.95	28.81 x	0.13 =	3.75			(30)
Roof Type2 3.02 0.64	2.38 x	0.13 =	0.31			(30)
Total area of elements, m ²	165.72					(31)
Party wall	28.78 x	0 =	0			(32)
Party wall	27.84 x	0 =	0			(32)
Party wall	32.1 x	0 =	0			(32)
Party wall	32.96 x	0 =	0			(32)
Party wall	38.6 x	0 =	0			(32)
Party wall	40 x	0 =	0			(32)
* for windows and roof windows, use effective window L ** include the areas on both sides of internal walls and p		g formula 1/[(1/U-val	lue)+0.04] as given i	n paragraph	3.2	
Fabric heat loss, $W/K = S (A \times U)$		(26)(30) + (32) =		[57.18	(33)
Heat capacity $Cm = S(A \times k)$		((28)	(30) + (32) + (32a))(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indica	ative Value: Medium	· [250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	uction are not known p	recisely the indicativ	re values of TMP in T	Table 1f		
Thermal bridges: S (L x Y) calculated using	Appendix K			Г	9.86	(36)
if details of thermal bridging are not known (36) = 0.15 x				L	0.00	(==)
Total fabric heat loss		(33) -	+ (36) =	[67.03	(37)
Ventilation heat loss calculated monthly	- r	(38)n	$n = 0.33 \times (25) \text{m x } (5)$	5)		
Jan Feb Mar Apr Ma		Aug Sep	Oct Nov	+		(00)
(38)m= 70.33 69.97 69.62 67.98 67.6°	66.24 66.24	65.97 66.79	67.67 68.29	68.94		(38)
Heat transfer coefficient, W/K	т т		n = (37) + (38)m			
(39)m= 137.36 137 136.65 135.01 134.	7 133.27 133.27	133 133.82	134.7 135.32	-	125.01	(39)
Heat loss parameter (HLP), W/m²K		(40)n	Average = Sum(39) $n = (39)m \div (4)$	1 ₁₁₂ / 1 Z =	135.01	(39)
(40)m= 1.28 1.28 1.27 1.26 1.25	1.24 1.24	1.24 1.25	1.25 1.26	1.27		
Number of days to see the AT 11 A 2			Average = Sum(40)	112 /12=	1.26	(40)
Number of days in month (Table 1a)	ادرا المدرا	Λικ Οσ-	Oct New	Deal		
Jan Feb Mar Apr Ma	y Jun Jul	Aug Sep	Oct Nov	Dec		

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•											
4. Water hea	iting ene	rgy requ	irement:								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.		.8		(42)
Annual average Reduce the annual not more that 123	ge hot wa gal average	hot water	usage by	5% if the a	lwelling is	designed			se target o		0.66		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 110.73	106.7	102.67	98.65	94.62	90.59	90.59	94.62	98.65	102.67	106.7	110.73		٦
Energy content of	f hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	т х пт х <u>Г</u>	OTm / 3600		Total = Sui oth (see Ta	. ,		1207.91	(44)
(45)m= 164.2	143.61	148.2	129.2	123.97	106.98	99.13	113.75	115.11	134.15	146.44	159.02		
If instantaneous	water heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1583.76	(45)
(46)m= 24.63	21.54	22.23	19.38	18.6	16.05	14.87	17.06	17.27	20.12	21.97	23.85		(46)
Water storage		\			/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				1		•		
Storage volun	•		•			_		ame ves	sel		150		(47)
If community Otherwise if n	_			_			` '	ers) ente	er 'O' in <i>(</i>	4 7)			
Water storage		not wate	, (tillo li	ioiddc3 i	Hotaritai	icous cc	ATTION DOIL	Cio, Cinc	51 0 111 (- '')			
a) If manufac		eclared I	oss fact	or is kno	wn (kWł	n/day):				1	.7		(48)
Temperature	factor fro	m Table	2b							0.	54		(49)
Energy lost from		•			:		(48) x (49)) =		0.	92		(50)
b) If manufact Hot water stor			-								0		(51)
If community	•			- (• • • • • • • • • • • • • • • • • • • •					0		(-)
Volume factor											0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Enter (50) or	. , .	•					((50)	(55)		0.	92		(55)
Water storage							1	(55) × (41)ı					(50)
(56)m= 28.48 If cylinder contain	25.73	28.48	27.57 rage. (57)	28.48 m = (56)m	27.57 x [(50) – (28.48 H11)l ÷ (5	28.48 0), else (5	27.57 7)m = (56)	28.48 m where (27.57 H11) is fro	28.48 m Append	ix H	(56)
(57)m= 28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(57)
` /		<u> </u>		<u> </u>							0		(58)
Primary circui Primary circui	•	•			59)m = ((58) ÷ 36	65 × (41)	ım			O		(00)
(modified b				,	•	. ,	, ,		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) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat rec	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 215.95	190.35	199.94	179.28	175.72	157.05	150.88	165.5	165.19	185.9	196.51	210.77		(62)

Company Comp	Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)													
Output from water heater (64)ms	(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
Company Comp	(63)m= 0 0	0	0	0	0	0	C		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]	Output from water heater	•							•		•		•	
Heat gains from water heating, kWh/month 0.25 * [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m = 95.99 85.14 90.67 83.02 82.62 75.63 74.36 79.22 78.34 86 88.75 94.27 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating Secondary Secon	(64)m= 215.95 190.35 19	99.94	179.28	175.72	157.05	150.88	165	5.5	165.19	185.9	196.51	210.77		
65 ms 95.99 85.14 90.67 83.02 82.62 75.63 74.36 79.22 78.34 86 88.75 94.27 (65)								Outp	ut from wa	iter heat	er (annual) ₁	12	2193.04	(64)
Include (57)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	5 × (45)m	+ (6	31)m] + 0.8 x	[(46)n	n + (57)m	+ (59)m]	
Metabolic gains (Table 5), Watts	(65)m= 95.99 85.14 9	0.67	83.02	82.62	75.63	74.36	79.	22	78.34	86	88.75	94.27		(65)
Metabolic gains (Table 5), Wats Jan	include (57)m in calcula	ation o	f (65)m	only if c	ylinder	is in the	llewb	ling o	or hot wa	ater is	from com	munity h	eating	
Second Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 139.91	5. Internal gains (see Ta	able 5	and 5a)):										
Second Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 139.91	Metabolic gains (Table 5)	, Watt	S											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 23.87 21.2 17.24 13.05 9.76 8.24 8.9 11.57 15.53 19.72 23.02 24.54 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 267.77 270.54 263.54 248.64 229.82 212.14 200.32 197.54 204.54 219.45 238.27 255.95 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 36.99 36				May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Company 23.87 21.2 17.24 13.05 9.76 8.24 8.9 11.57 15.53 19.72 23.02 24.54	(66)m= 139.91 139.91 13	39.91	139.91	139.91	139.91	139.91	139	.91	139.91	139.91	139.91	139.91		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 267.77 270.54 263.54 248.64 229.82 212.14 200.32 197.54 204.54 219.45 238.27 255.95 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 36.99 3	Lighting gains (calculated	l in Ap	pendix l	L, equat	ion L9 c	r L9a), a	lso s	ee T	Table 5		•	•	•	
(68)me 267.77 270.54 263.54 248.64 229.82 212.14 200.32 197.54 204.54 219.45 238.27 255.95 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)me 36.99	(67)m= 23.87 21.2 1	7.24	13.05	9.76	8.24	8.9	11.	57	15.53	19.72	23.02	24.54		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 36.99 3	Appliances gains (calcula	ited in	Append	dix L, eq	uation L	.13 or L1	3a),	also	see Tab	ole 5	•	!	•	
(69) m= 36.99 36.9	(68)m= 267.77 270.54 20	63.54	248.64	229.82	212.14	200.32	197	.54	204.54	219.45	238.27	255.95		(68)
(69) m= 36.99 36.9	Cooking gains (calculated	d in Ap	pendix	L, equat	tion L15	or L15a	, als	o se	e Table	5	-		ı	
Columbia		 i				T	i —		1		36.99	36.99		(69)
Columbia	Pumps and fans gains (Ta	able 5	 a)			-1	!	!					<u> </u>	
Water heating gains (Table 5) (72)m= 129.02 126.7 121.87 115.31 111.04 105.04 99.94 106.48 108.8 115.6 123.27 126.71 (72) Total internal gains =	· 			3	3	3	3	3	3	3	3	3		(70)
Water heating gains (Table 5) (72)m= 129.02 126.7 121.87 115.31 111.04 105.04 99.94 106.48 108.8 115.6 123.27 126.71 (72) Total internal gains =	Losses e.g. evaporation (negati	ve valu	es) (Tab	le 5)	<u>!</u>			<u>l</u>		1	!		
Total internal gains =				<u> </u>	–	-111.93	-111	.93	-111.93	-111.93	-111.93	-111.93		(71)
Total internal gains =	Water heating gains (Tab	le 5)			<u> </u>	!					-1	<u> </u>		
(73)m= 488.64 486.42 470.63 444.97 418.6 393.39 377.14 383.57 396.85 422.74 452.52 475.17 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d		 _	115.31	111.04	105.04	99.94	106	.48	108.8	115.6	123.27	126.71		(72)
(73)me 488.64 486.42 470.63 444.97 418.6 393.39 377.14 383.57 396.85 422.74 452.52 475.17 (73) 6. 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 Gains (W) Northeast 0.9x 0.77 x 3.46 x 11.28 x 0.63 x 0.7 = 11.93 (75) Northeast 0.9x 0.77 x 3.46 x 11.28 x 0.63 x 0.7 = 11.93 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x	Total internal gains =				(66	i)m + (67)m	ı + (68	3)m +	(69)m + (1	70)m + (71)m + (72))m	l	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area m² Flux Table 6a g_ Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.77 x 3.46 x 11.28 x 0.63 x 0.7 = 11.93 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x 3.46 x 41.38 x 0.63 x 0.7 = 43.75 (75) Northeast 0.9x 0.77 x 3.46 x 41.38 x 0.63 x 0.7 = 43.75 (75) Northeast 0.9x 0.77 x 3.46 x 67.96 x 0.63 x 0.7 = 71.86 (75) Northeast 0.9x 0.77 x 3.46 x 67.96 x 0.63 x 0.7 = 71.86 (75)		70.63	444.97	418.6	393.39	377.14	383	.57	396.85	422.74	452.52	475.17		(73)
Orientation: Access Factor Table 6d Area m² Flux Table 6a g_{-} Table 6b FF Table 6c Gains (W) Northeast $0.9x$ 0.77 x 3.46 x 11.28 x 0.63 x 0.7 x 0.63 x $0.$	6. Solar gains:							-				l		
Table 6d m² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 3.46 x 11.28 x 0.63 x 0.7 = 11.93 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x 3.46 x 22.97 x 0.63 x 0.7 = 24.29 (75) Northeast 0.9x 0.77 x 3.46 x 41.38 x 0.63 x 0.7 = 43.75 (75) Northeast 0.9x 0.77 x 3.46 x 41.38 x 0.63 x 0.7 = 43.75 (75) Northeast 0.9x 0.77 x 3.46 x 67.96 x 0.63 x 0.7 = 71.86 (75) Northeast 0.9x 0.77 <td< td=""><td>Solar gains are calculated usir</td><td>ng solar</td><td>flux from</td><td>Table 6a</td><td>and asso</td><td>ciated equa</td><td>tions</td><td>to coi</td><td>nvert to the</td><td>e applica</td><td>able orienta</td><td>tion.</td><td></td><td></td></td<>	Solar gains are calculated usir	ng solar	flux from	Table 6a	and asso	ciated equa	tions	to coi	nvert to the	e applica	able orienta	tion.		
Northeast 0.9x		tor						_		_				
Northeast 0.9x	Table 6d		m²		Ta	ble 6a		Ta	able 6b		l able 6c		(VV)	
Northeast 0.9x	Northeast _{0.9x} 0.77	X	3.4	-6	X	11.28	X		0.63	x	0.7	=	11.93	(75)
Northeast 0.9x	Northeast 0.9x 0.77	X	3.4	-6	X	11.28	X		0.63	x	0.7	=	11.93	(75)
Northeast 0.9x	Northeast _{0.9x} 0.77	X	3.4	-6	X	22.97	X		0.63	X	0.7	=	24.29	(75)
Northeast 0.9x	Northeast _{0.9x} 0.77	X	3.4	-6	x	22.97	x		0.63	x	0.7	=	24.29	(75)
Northeast 0.9x	Northeast 0.9x 0.77	x	3.4	-6	x	41.38	x		0.63	x [0.7	=	43.75	(75)
Northeast 0.9x	Northeast 0.9x 0.77	x	3.4	-6	x	41.38	x		0.63	x [0.7	=	43.75	(75)
	Northeast 0.9x 0.77	x	3.4	-6	x	67.96	x		0.63	x	0.7	=	71.86	(75)
Northeast 0.9x 0.77 x 3.46 x 91.35 x 0.63 x 0.77 = 96.59 (75)	Northeast 0.9x 0.77	x	3.4	-6	x	67.96	x		0.63	X	0.7		71.86	(75)
	Northeast 0.9x 0.77	x	3.4	6	x	91.35	x		0.63	×	0.7		96.59	(75)
Northeast 0.9x 0.77 x 3.46 x 91.35 x 0.63 x 0.7 = 96.59 (75)	Northeast 0.9x 0.77	x	3.4	-6	x	91.35	x		0.63	×	0.7	=	96.59	(75)

Northogot a a		7		ı		1		i		1		¬
Northeast 0.9x	0.77	X	3.46	X	97.38	X	0.63	X	0.7	=	102.98	(75)
Northeast 0.9x	0.77	X	3.46	X	97.38	X	0.63	X	0.7] = 1	102.98	(75)
Northeast 0.9x	0.77	X	3.46	X	91.1	X	0.63	X	0.7] =	96.33	(75)
Northeast _{0.9x}	0.77	X	3.46	X	91.1	X	0.63	X	0.7] =	96.33	<u> </u> (75)
Northeast _{0.9x}	0.77	X	3.46	Х	72.63	X	0.63	X	0.7	=	76.8	(75)
Northeast _{0.9x}	0.77	X	3.46	X	72.63	X	0.63	X	0.7] =	76.8	(75)
Northeast 0.9x	0.77	X	3.46	Х	50.42	X	0.63	X	0.7] =	53.32	(75)
Northeast _{0.9x}	0.77	X	3.46	X	50.42	X	0.63	X	0.7	=	53.32	(75)
Northeast _{0.9x}	0.77	X	3.46	X	28.07	X	0.63	X	0.7	=	29.68	(75)
Northeast 0.9x	0.77	X	3.46	X	28.07	X	0.63	X	0.7	=	29.68	(75)
Northeast _{0.9x}	0.77	X	3.46	Х	14.2	X	0.63	X	0.7	=	15.01	(75)
Northeast _{0.9x}	0.77	X	3.46	Х	14.2	X	0.63	X	0.7	=	15.01	(75)
Northeast _{0.9x}	0.77	X	3.46	X	9.21	X	0.63	X	0.7	=	9.74	(75)
Northeast _{0.9x}	0.77	X	3.46	x	9.21	X	0.63	X	0.7	=	9.74	(75)
Southwest _{0.9x}	0.77	X	3.18	X	36.79		0.63	X	0.7	=	35.76	(79)
Southwest _{0.9x}	0.77	X	3.41	X	36.79		0.63	X	0.7	=	38.34	(79)
Southwest _{0.9x}	0.77	X	3.18	X	36.79		0.63	X	0.7	=	35.76	(79)
Southwest _{0.9x}	0.77	X	3.18	X	36.79		0.63	x	0.7	=	35.76	(79)
Southwest _{0.9x}	0.77	X	3.18	x	62.67		0.63	X	0.7	=	60.91	(79)
Southwest _{0.9x}	0.77	X	3.41	X	62.67		0.63	X	0.7	=	65.31	(79)
Southwest _{0.9x}	0.77	X	3.18	x	62.67		0.63	X	0.7	=	60.91	(79)
Southwest _{0.9x}	0.77	X	3.18	X	62.67		0.63	X	0.7	=	60.91	(79)
Southwest _{0.9x}	0.77	X	3.18	X	85.75		0.63	X	0.7	=	83.34	(79)
Southwest _{0.9x}	0.77	X	3.41	x	85.75		0.63	X	0.7	=	89.37	(79)
Southwest _{0.9x}	0.77	X	3.18	x	85.75		0.63	x	0.7	=	83.34	(79)
Southwest _{0.9x}	0.77	X	3.18	X	85.75		0.63	X	0.7	=	83.34	(79)
Southwest _{0.9x}	0.77	X	3.18	x	106.25		0.63	X	0.7	=	103.26	(79)
Southwest _{0.9x}	0.77	X	3.41	X	106.25		0.63	X	0.7	=	110.73	(79)
Southwest _{0.9x}	0.77	X	3.18	X	106.25		0.63	X	0.7	=	103.26	(79)
Southwest _{0.9x}	0.77	X	3.18	x	106.25		0.63	X	0.7	=	103.26	(79)
Southwest _{0.9x}	0.77	X	3.18	x	119.01		0.63	x	0.7	=	115.66	(79)
Southwest _{0.9x}	0.77	X	3.41	x	119.01		0.63	x	0.7	=	124.03	(79)
Southwest _{0.9x}	0.77	X	3.18	x	119.01		0.63	x	0.7	=	115.66	(79)
Southwest _{0.9x}	0.77	X	3.18	x	119.01]	0.63	x	0.7	=	115.66	(79)
Southwest _{0.9x}	0.77	X	3.18	x	118.15		0.63	x	0.7	=	114.82	(79)
Southwest _{0.9x}	0.77	X	3.41	x	118.15		0.63	x	0.7	=	123.13	(79)
Southwest _{0.9x}	0.77	X	3.18	x	118.15		0.63	x	0.7	=	114.82	(79)
Southwest _{0.9x}	0.77	X	3.18	x	118.15]	0.63	x	0.7	=	114.82	(79)
Southwest _{0.9x}	0.77	X	3.18	x	113.91]	0.63	x	0.7] =	110.7	(79)
Southwest _{0.9x}	0.77	X	3.41	x	113.91]	0.63	x	0.7	=	118.71	(79)
Southwest _{0.9x}	0.77	X	3.18	x	113.91]	0.63	x	0.7	=	110.7	(79)
_		_				-				_		

		1		1				ı		,		_
Southwest _{0.9x}	0.77	X	3.18	Х	113.91		0.63	X	0.7	=	110.7	(79)
Southwest _{0.9x}	0.77	X	3.18	X	104.39		0.63	X	0.7	=	101.45	(79)
Southwest _{0.9x}	0.77	X	3.41	X	104.39		0.63	Х	0.7] =	108.79	(79)
Southwest _{0.9x}	0.77	X	3.18	X	104.39		0.63	X	0.7	=	101.45	(79)
Southwest _{0.9x}	0.77	X	3.18	X	104.39		0.63	X	0.7	=	101.45	(79)
Southwest _{0.9x}	0.77	X	3.18	X	92.85		0.63	X	0.7	=	90.24	(79)
Southwest _{0.9x}	0.77	X	3.41	X	92.85		0.63	X	0.7	=	96.76	(79)
Southwest _{0.9x}	0.77	X	3.18	X	92.85		0.63	X	0.7	=	90.24	(79)
Southwest _{0.9x}	0.77	X	3.18	X	92.85		0.63	х	0.7	=	90.24	(79)
Southwest _{0.9x}	0.77	X	3.18	X	69.27		0.63	X	0.7	=	67.32	(79)
Southwest _{0.9x}	0.77	X	3.41	X	69.27		0.63	X	0.7	=	72.19	(79)
Southwest _{0.9x}	0.77	X	3.18	X	69.27		0.63	X	0.7	=	67.32	(79)
Southwest _{0.9x}	0.77	X	3.18	X	69.27		0.63	X	0.7	=	67.32	(79)
Southwest _{0.9x}	0.77	X	3.18	X	44.07		0.63	X	0.7	=	42.83	(79)
Southwest _{0.9x}	0.77	X	3.41	X	44.07		0.63	X	0.7	=	45.93	(79)
Southwest _{0.9x}	0.77	X	3.18	x	44.07		0.63	x	0.7	=	42.83	(79)
Southwest _{0.9x}	0.77	X	3.18	x	44.07		0.63	x	0.7	=	42.83	(79)
Southwest _{0.9x}	0.77	X	3.18	x	31.49		0.63	X	0.7	=	30.6	(79)
Southwest _{0.9x}	0.77	X	3.41	x	31.49		0.63	X	0.7	=	32.81	(79)
Southwest _{0.9x}	0.77	X	3.18	x	31.49		0.63	x	0.7	=	30.6	(79)
Southwest _{0.9x}	0.77	X	3.18	x	31.49		0.63	x	0.7	=	30.6	(79)
Northwest 0.9x	0.77	X	0.92	X	11.28	X	0.63	X	0.7	=	3.17	(81)
Northwest 0.9x	0.77	X	0.92	X	22.97	X	0.63	X	0.7	=	6.46	(81)
Northwest 0.9x	0.77	X	0.92	x	41.38	X	0.63	X	0.7	=	11.63	(81)
Northwest 0.9x	0.77	X	0.92	X	67.96	X	0.63	X	0.7	=	19.11	(81)
Northwest 0.9x	0.77	X	0.92	X	91.35	X	0.63	X	0.7	=	25.68	(81)
Northwest 0.9x	0.77	X	0.92	X	97.38	X	0.63	X	0.7	=	27.38	(81)
Northwest 0.9x	0.77	X	0.92	X	91.1	X	0.63	X	0.7	=	25.61	(81)
Northwest 0.9x	0.77	X	0.92	X	72.63	X	0.63	X	0.7	=	20.42	(81)
Northwest 0.9x	0.77	X	0.92	X	50.42	X	0.63	X	0.7	=	14.18	(81)
Northwest 0.9x	0.77	X	0.92	X	28.07	X	0.63	X	0.7	=	7.89	(81)
Northwest 0.9x	0.77	X	0.92	X	14.2	X	0.63	X	0.7	=	3.99	(81)
Northwest 0.9x	0.77	X	0.92	x	9.21	X	0.63	x	0.7	=	2.59	(81)
Rooflights _{0.9x}	1	X	2.21	X	26	X	0.63	X	0.7	=	22.77	(82)
Rooflights _{0.9x}	1	X	0.74	x	26	x	0.63	x	0.7	=	7.64	(82)
Rooflights 0.9x	1	x	0.64	x	26	x	0.63	x	0.7	=	6.62	(82)
Rooflights 0.9x	1	x	2.21	x	54	x	0.63	x	0.7	=	47.29	(82)
Rooflights 0.9x	1	x	0.74	x	54	x	0.63	x	0.7	=	15.86	(82)
Rooflights 0.9x	1	x	0.64	x	54	x	0.63	x	0.7	=	13.75	(82)
Rooflights 0.9x	1	x	2.21	x	96	x	0.63	x	0.7	=	84.08	(82)
Rooflights 0.9x	1	x	0.74	x	96	x	0.63	x	0.7	=	28.19	(82)
						·						-

Rooflights 0.9x	1	x	0.64		x	96] x	0.63	x	0.7		24.45	(82)
Rooflights 0.9x	<u>·</u> 1	x	2.21		x 🔚	150]]	0.63	= x	0.7	╡ -	131.37	(82)
Rooflights 0.9x	1	X	0.74		x -	150]]	0.63	X	0.7	╡ -	44.05	(82)
Rooflights 0.9x	1	X	0.64		x	150]]	0.63	X	0.7	╡ -	38.2	(82)
Rooflights 0.9x	1	X	2.21		x 🗀	192]]	0.63	= x	0.7	╡ -	168.15	(82)
Rooflights 0.9x	1	X	0.74		x 🗀	192]]	0.63	×	0.7	╡ -	56.38	(82)
Rooflights 0.9x	1	X	0.64	_	x	192]]	0.63	 x	0.7	╡ -	48.9	(82)
Rooflights 0.9x	1	X	2.21		x 🗀	200	J D X	0.63	\exists x	0.7	╡ -	175.16	(82)
Rooflights 0.9x	1	Х	0.74		x	200] x	0.63	x	0.7		58.73	(82)
Rooflights 0.9x	1	х	0.64		x	200] x	0.63	×	0.7	_ =	50.94	(82)
Rooflights 0.9x	1	x	2.21		x	189]]	0.63	X	0.7		165.52	(82)
Rooflights 0.9x	1	Х	0.74		x	189] x	0.63	X	0.7		55.5	(82)
Rooflights 0.9x	1	x	0.64		x	189]]	0.63	→ x	0.7	╡ -	48.13	(82)
Rooflights 0.9x	1	X	2.21		x	157]]	0.63	-	0.7	╡ -	137.5	(82)
Rooflights 0.9x	1	X	0.74	=	x 🗀	157	」 】	0.63	= x	0.7	╡ -	46.1	(82)
Rooflights 0.9x	1	X	0.64	一 :	x 🗀	157]]	0.63	= x	0.7	╡ .	39.98	(82)
Rooflights 0.9x	1	X	2.21		x 🗀	115]]	0.63	= x	0.7	╡ -	100.72	(82)
Rooflights 0.9x	1	X	0.74		x	115]]	0.63	X	0.7	╡ -	33.77	(82)
Rooflights 0.9x	1	X	0.64		x 🗀	115]]	0.63	\exists x	0.7	╡ -	29.29	(82)
Rooflights 0.9x	1	X	2.21		x	66]]	0.63	-	0.7	╡ -	57.8	(82)
Rooflights 0.9x	1	X	0.74	_	x	66]]	0.63	X	0.7	╡ -	19.38	(82)
Rooflights 0.9x	1	X	0.64		x 🗀	66	J X	0.63	\exists x	0.7	╡ -	16.81	(82)
Rooflights 0.9x	1	X	2.21		x 🗀	33	J D X	0.63	= x	0.7	╡ -	28.9	(82)
Rooflights 0.9x	1	X	0.74	=	x 🗀	33	」 】	0.63	= x	0.7	╡ -	9.69	(82)
Rooflights _{0.9x}	1	X	0.64		x -	33	J X	0.63	→ x	0.7	╡ -	8.4	(82)
Rooflights 0.9x	1	Х	2.21		x	21] x	0.63	x	0.7		18.39	(82)
Rooflights 0.9x	1	х	0.74		x	21] x	0.63	×	0.7		6.17	(82)
Rooflights 0.9x	1	X	0.64		x -	21]]	0.63	- x	0.7	╡ -	5.35	(82)
L					<u> </u>		J						
Solar gains in	watts, ca	alculated	for each	month			(83)m	ı = Sum(74)m .	(82)m			_	
(83)m= 209.68	379.97	575.24	796.95	963.3	985.76	938.26	810	.75 652.06	435.38	255.43	176.6]	(83)
Total gains – i	nternal a	nd solar	(84)m = 0	(73)m +	- (83)m	, watts		•				-	
(84)m= 698.32	866.39	1045.87	1241.92	1381.9	1379.15	1315.4	1194	1.31 1048.91	858.12	707.95	651.77		(84)
7. Mean inter	nal temp	erature (heating s	season)									
Temperature	during h	eating pe	eriods in t	the livin	ng area	from Tal	ble 9	Th1 (°C)				21	(85)
Utilisation fac	tor for ga	ains for li	ving area	ı, h1,m	(see Ta	able 9a)							<u></u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug Sep	Oct	Nov	Dec]	
(86)m= 1	0.99	0.97	0.92	0.78	0.59	0.44	0.	5 0.77	0.96	0.99	1		(86)
Mean interna	l tempera	ature in I	iving area	a T1 (fo	llow ste	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.64	19.85	20.18	20.57	20.85	20.97	20.99	20.	99 20.9	20.5	19.99	19.6]	(87)
Temperature	during h	eating po	eriods in	rest of o	dwelling	from Ta	able 9	9, Th2 (°C)					
(88)m= 19.86	19.86	19.86	19.87	19.88	19.89	19.89	19.		19.88	19.87	19.87]	(88)
		. <u> </u>					•	•	a	•		-	

Litilicat	ion foo	tor for a	aine for I	ract of d	volling k	2 m (cc	ee Table	00)						
(89)m=	1	0.99	0.97	0.89	0.72	0.5	0.33	0.39	0.68	0.94	0.99	1		(89)
_			ļ								0.99	'		(00)
(90)m=	18.05	temper	18.84	the rest	of dwelli	ng 12 (fo	ollow ste	19.89	/ IN Tabl	e 9c) 19.32	18.58	18.01		(90)
(90)111=	10.03	10.57	10.04	13.4	13.74	19.07	19.09	19.09		!	g area ÷ (4		0.33	(91)
											3 ('	0.55	
	T				1		LA × T1		_					(00)
(92)m=	18.57	18.85	19.28	19.78	20.11	20.23	20.25	20.25	20.17	19.71	19.04	18.53		(92)
· · · · · -	18.57	18.85	ne mean 19.28	19.78	tempera 20.11	20.23	m Table	4e, wne	20.17	·	19.04	10.52		(93)
(93)m=					20.11	20.23	20.25	20.25	20.17	19.71	19.04	18.53		(93)
		·	uirement		o obtoin	ad at at	on 11 of	Table Ok	o oo tha	+ Ti m_/	76\m an	d ro colo	uloto	
				using Ta		eu ai sii		Table 9), 50 tha		rojili ali	d re-calc	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat			ains, hm	:							•			
(94)m=	0.99	0.99	0.96	0.89	0.73	0.53	0.37	0.42	0.71	0.94	0.99	1		(94)
			<u> </u>	4)m x (84			I			I	I	1		(0-)
(/	694.49	854.1		1099.85		730.47	483.51	506.39	740.56	802.65	699.48	649.12		(95)
				perature										(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)
	ī						=[(39)m :		<u> </u>	-	4646.00	4040.04		(07)
` ′	1960.46		1746.33		1132.4	750.27	486.29	511.7	811.88	1226.81	1616.38	1948.81		(97)
	941.89	710.64	551.79	266.15	88.15	0	th = 0.02	24 X [(97))m – (95 0	315.58	660.16	966.97		
(90)111=	341.03	7 10.04	331.79	200.13	00.13	0				<u> </u>			4501.33	(98)
Space	hoating	a roquir	oment in	kWh/m²	lyoar			TOIA	l per year	(KVVII/yeai) = Sum(9	0)15,912 =](99)
·	· ·	- ·			•							l	41.91	
			nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space Fraction		_	at from so	econdar	//sunnle	mentarv	svetem					[0	(201)
	•			nain syst		mornary	•	(202) = 1 -	- (201) =			l I	1	(202)
	•			•	` ,			` '	` '	(202)] -		<u> </u> 		╡
			Ū	main sys				(204) = (20	02) x [1 –	(203)] =		ļ	1	(204)
	•	•		ing syste								ļ	93.5	(206)
Efficier	ncy of s	econda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	heating	g require	ement (c	alculate	d above)									
	941.89	710.64	551.79	266.15	88.15	0	0	0	0	315.58	660.16	966.97		
(211)m	= {[(98)	m x (20	4)] } x 1	00 ÷ (20	6)									(211)
1	1007.36	760.04	590.15	284.66	94.28	0	0	0	0	337.52	706.06	1034.19		
								Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4814.26	(211)
Space	heating	g fuel (s	econdar	y), kWh/	month							•		-
= {[(98 <u>)</u> r	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)

Water heating								
Output from water heater (calculated above) 215.95	57.05 150.88	165.5	165.19	185.9	196.51	210.77]	
Efficiency of water heater							79.8	(216)
(217)m= 88.29 88.01 87.38 85.87 83.08	79.8 79.8	79.8	79.8	86.21	87.8	88.38		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•							
(219)m= 244.58 216.29 228.81 208.79 211.5 1	96.81 189.07	207.39	207	215.62	223.82	238.48		_
		Tota	I = Sum(2				2588.17	(219)
Annual totals				k'	Wh/year	ſ	kWh/year	7
Space heating fuel used, main system 1							4814.26	_
Water heating fuel used							2588.17	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue		(230e)						
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							421.58	(232)
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	ır
Space heating (main system 1)	(211) x			0.2	16	=	1039.88	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	559.05	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1598.92	(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	=	218.8	(268)
Total CO2, kg/year			sum o	of (265)(271) =		1856.65	(272)

TER =

(273)

25.48

		User Details:					
Assessor Name:	Su Lee	Stroma Num	nber:	STRO)31315		
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Version	sion: 1.0.4.16		
	Pro	perty Address: Unit 03	3				
Address :	138-140 Highgate Road, High	gate, Highgate, NW5	1PB				
1. Overall dwelling dime	ensions:				(0)		
Basement		Area(m²) 40.51 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)	
Ground floor		35.41 (1b) x	3.2	(2b) =	113.31	(3b)	
First floor		32.25 (1c) x	4.65	(2c) =	149.96] (3c)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	108.17 (4)		L		_	
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	(3n) =	372.65	(5)	
2. Ventilation rate:				_			
	main secondary heating heating	other	total		m³ per hour	•	
Number of chimneys		+ 0 =	0 x 4	0 =	0	(6a)	
Number of open flues	0 + 0	+ 0 =	0 x 2	10 =	0	(6b)	
Number of intermittent fa	ns		4 x 1	0 =	40	(7a)	
Number of passive vents			0 x 1	0 =	0	(7b)	
Number of flueless gas fi	res		0 x 4	0 =	0	(7c)	
				Air cha	anges per ho	ur	
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	40 ÷	- (5) =	0.11	(8)	
	een carried out or is intended, proceed t	to (17), otherwise continue f	rom (9) to (16)	_		_	
Number of storeys in the	ne dwelling (ns)			L	0	(9)	
Additional infiltration				1]x0.1 =	0	(10)	
	.25 for steel or timber frame or 0	•	ruction	L	0	(11)	
deducting areas of openii	resent, use the value corresponding to things); if equal user 0.35	ne greater wall area (atter					
=	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		Γ	0	(12)	
If no draught lobby, en	ter 0.05, else enter 0			Ī	0	(13)	
Percentage of windows	s and doors draught stripped			Ī	0	(14)	
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	Ī	0	(15)	
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	Ī	0	(16)	
Air permeability value,	q50, expressed in cubic metres	per hour per square m	netre of envelope	area	5	(17)	
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		Ī	0.36	(18)	
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used	_		_	
Number of sides sheltere	ed				2	(19)	
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =		0.85	(20)	
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =			0.3	(21)	
Infiltration rate modified f	or monthly wind speed						
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec			
Monthly average wind sp	eed from Table 7						

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (22	2a)m = ((22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
A diversal infilmed	4:	. /-!!:		-14	ماددنده		(04 =)	(00-)					
Adjusted infiltrat	0.38	0.37	ng for sr 0.33	0.33	a wina s	peed) =	0.28	(22a)m 0.3	0.33	0.34	0.36		
Calculate effect							0.26	0.3	0.33	0.34	0.36		
If mechanical		_		.,								0	(23a)
If exhaust air hea	at pump u	ising Appe	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)), othe	rwise (23b) = (23a)			0	(23b)
If balanced with h	heat reco	very: effic	iency in %	allowing for	or in-use fa	actor (from	Table 4h) =			ĺ	0	(23c)
a) If balanced	d mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (2)	2b)m + (23b) × [1	- (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced	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		(24b)
c) If whole ho				•					_				
if (22b)m	-	<u> </u>		, <u> </u>		· ·	ŕ	ŕ	· `	<u> </u>			(0.4-)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural vo if (22b)m									0.51				
(24d)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air c	l change	rate - er	ter (24a	or (24h	o) or (240	c) or (24	d) in box	(25)	ļ				
(25)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
	· ·						ı		•				
3 Heat losses	and he	at lose r	aramete	ar.									
3. Heat losses		•			Net Ar	ea	U-valı	ıe	AXU		k-value		A X k
3. Heat losses ELEMENT	and he Gros area	S	oaramete Openin m	gs	Net Ard A ,n		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros	S	Openin	gs						<)			
ELEMENT	Gros area	S	Openin	gs	A ,n	n² x	W/m2	K =	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area 1	S	Openin	gs	A ,n	m ² x x x1/	W/m2	= 0.04] =	(W/F	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	S	Openin	gs	A ,n 2.46 3.21	x 1/	W/m2 1 /[1/(1.4)+	0.04] = 0.04] =	2.46 4.26	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type 2	Gros area 1 2	S	Openin	gs	A ,n 2.46 3.21 3.44	x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.46 4.26 4.56	<) 			kJ/K (26) (27) (27)
Doors Windows Type 2 Windows Type 2 Windows Type 3	Gros area 1 2 3	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92	x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	2.46 4.26 4.56 1.22	<)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4	Gros area 1 2 3 4 5	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92 3.21	x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	2.46 4.26 4.56 1.22 4.26	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4	Gros area 1 2 3 4 5	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49	x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	2.46 4.26 4.56 1.22 4.26 4.63	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6 Windows Type 6	Gros area 1 2 3 4 5 6	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26				kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6	Gros area 1 2 3 4 5 6 7	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type : Rooflights Type	Gros area 1 2 3 4 5 6 7 1 2 1	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 2.22397	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+	0.04] = 0.04]	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075	5 1			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6 Windows Type 6 Windows Type 6 Windows Type 6 Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 1 2 1	S	Openin	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 2.22397 0.74572	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	0.04] = 0.04]	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075 1.26773	5 1 8			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6 Windows Type 6 Windows Type 7 Rooflights Type Rooflights Type Rooflights Type Floor	Gros area 1 2 3 4 5 6 7 9 1 9 2 9 3	s (m²)	Openin m	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 0.74572 0.64673 40.51	x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	0.04] = 0.04]	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075 1.26773 1.09944	5 1 8			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type : Rooflights Type Rooflights Type Rooflights Type Floor Walls Type 1	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	s (m²)	Openin m	gs	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 0.74572 0.64673 40.51	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1	K	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075 1.26773 1.09944 5.2663 1.85	5 1 8			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6 Windows Type 6 Windows Type 7 Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type 1 Walls Type 2	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	s (m²)	Openin m	gs ²	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 2.22397 0.74572 0.64673 40.51 10.29	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[K	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075 1.26773 1.09944 5.2663 1.85	5 1 8			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6 Windows Type 6 Windows Type 7 Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type 1 Walls Type 2 Walls Type 3	Gros area 1 2 3 4 5 6 7 1 2 3 10.2 1.35	s (m²)	0 3.21 0.92	gs ²	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 0.74572 0.64673 40.51 10.29 1.87 0.43	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18	K	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075 1.26773 1.09944 5.2663 1.85 0.34	5 1 8			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29) (29)
ELEMENT Doors Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 4 Windows Type 6 Windows Type 6 Windows Type 7 Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type 1 Walls Type 2	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	s (m²)	Openin m	gs ²	A ,n 2.46 3.21 3.44 0.92 3.21 3.49 3.21 3.49 2.22397 0.74572 0.64673 40.51 10.29	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[K	(W/N 2.46 4.26 4.56 1.22 4.26 4.63 4.26 4.63 3.78075 1.26773 1.09944 5.2663 1.85	5 1 8			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8 ×	0.18	0.14			(29)
Walls Type7 0.96 0	0.96 ×	0.18	0.17			(29)
Walls Type8 6.02 0	6.02 ×	0.18	1.08			(29)
Walls Type9 4.96 0	4.96 ×	0.18	0.89			(29)
Walls Type10 5.76 3.21	2.55 ×	0.18	0.46			(29)
Walls Type11 0.42 0	0.42 ×	0.18	0.08			(29)
Walls Type12 6.4 0	6.4 ×	0.18	1.15			(29)
Walls Type13 9.11 3.49	5.62 ×	0.18	1.01			(29)
Walls Type14 1.86 0	1.86 ×	0.18	0.33			(29)
Walls Type15 8.6 2.46	6.14 ×	0.18	1.11			(29)
Walls Type16 9.3 0	9.3 ×	0.18 =	1.67			(29)
Walls Type17 0.6 0	0.6 ×	0.18 =	0.11			(29)
Walls Type18 8.37 3.21	5.16 ×	0.18 =	0.93			(29)
Roof Type1 31.76 2.97	28.79 ×	0.13	3.74			(30)
Roof Type2 3.31 0.65	2.66 ×	0.13	0.35			(30)
Total area of elements, m ²	166.94					(31)
Party wall	29.24 ×	0 =	0			(32)
Party wall	28.24 ×	0 =	0			(32)
Party wall	32.58 ×	0 =	0			(32)
Party wall	33.47 ×	0 =	0			(32)
Party wall	38.73 ×	0 =	0			(32)
Party wall	40 ×	0 =	0			(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and p		ng formula 1/[(1/U-va	alue)+0.04] as giver	n in paragraph	3.2	
Fabric heat loss, W/K = S (A x U)		(26)(30) + (32) :	=		57.6	(33)
Heat capacity $Cm = S(A \times k)$		((28	3)(30) + (32) + (32)	2a)(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indi	cative Value: Mediu	ım	250	(35)
For design assessments where the details of the constru- can be used instead of a detailed calculation.	iction are not known j	precisely the indicat	ive values of TMP in	n Table 1f		
Thermal bridges: S (L x Y) calculated using A	Appendix K			Г	9.88	(36)
if details of thermal bridging are not known (36) = $0.15 x$	• •			L		 _` ^
Total fabric heat loss		(33)	+ (36) =		67.48	(37)
Ventilation heat loss calculated monthly	 		$m = 0.33 \times (25) m x$			
Jan Feb Mar Apr May	 	Aug Ser	+ + + + + + + + + + + + + + + + + + + +			(20)
(38)m= 70.71 70.35 70 68.35 68.04	66.61 66.61			7 69.32		(38)
Heat transfer coefficient, W/K			m = (37) + (38)m	45 400 0		
(39)m= 138.19 137.83 137.48 135.83 135.52	2 134.09 134.09	9 133.82 134.6	4 135.52 136. ⁻ Average = Sum(3		135.83	(39)
Heat loss parameter (HLP), W/m²K		(40)	$m = (39)m \div (4)$	09/112 / 12-	155.05	_(00)
(40)m= 1.28 1.27 1.27 1.26 1.25	1.24 1.24	1.24 1.24	1.25 1.26	5 1.26		_
Number of days in month (Table 4a)			Average = Sum(4	(40) ₁₁₂ /12=	1.26	(40)
Number of days in month (Table 1a) Jan Feb Mar Apr May	y Jun Jul	Aug Sor	Oct No	ov Dec		
Jan Feb Mar Apr Mar	y j Juli j Jul	Aug Ser) Oct INC	Dec		

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•												
4. Water he	eating ene	rgy requ	irement:								kWh/ye	ear:	
Assumed od if TFA > 1 if TFA £ 1	3.9, N = 1		: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		.8		(42)
Annual aver Reduce the and not more that 1	age hot want	hot water	usage by	5% if the c	lwelling is	designed			se target o).78		(43)
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usag	e in litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 110.8	106.83	102.8	98.76	94.73	90.7	90.7	94.73	98.76	102.8	106.83	110.86		٦
Energy content	of hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	т х пт х <u>Г</u>	OTm / 3600		Total = Sui oth (see Ta	. ,		1209.36	(44)
(45)m= 164.	4 143.79	148.37	129.36	124.12	107.11	99.25	113.89	115.25	134.31	146.61	159.21		
If instantaneou	s water heati	ing at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1585.67	(45)
(46)m= 24.6	6 21.57	22.26	19.4	18.62	16.07	14.89	17.08	17.29	20.15	21.99	23.88		(46)
Water storage		\			/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				1				
Storage volu	•	,				_		ame ves	sel		150		(47)
If community Otherwise if	_			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage		not wate) (uno n	10144001	notantai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	010) 01110	31 O III (.,,			
a) If manufa	acturer's d	eclared I	oss fact	or is kno	wn (kWh	n/day):				1	.7		(48)
Temperature	e factor fro	m Table	2b							0.	54		(49)
Energy lost b) If manufa		•			or io not		(48) x (49)) =		0.	92		(50)
Hot water st			•								0		(51)
If community	heating s	see secti	on 4.3	,		• /							
Volume fact											0		(52)
Temperature											0		(53)
Energy lost		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) o	. , .	•	fa., a a a b				(/50) /	(FF) (44).		0.	92		(55)
Water storag					07.57		1	(55) × (41)		07.57	00.40		(FC)
(56)m= 28.4		28.48 ed solar sto	27.57 rage, (57)	28.48 m = (56)m	27.57 x [(50) – (28.48 H11)] ÷ (5	28.48 0), else (5	27.57 7)m = (56)	28.48 m where (27.57 H11) is fro	28.48 m Append	ix H	(56)
(57)m= 28.4		28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(57)
Primary circ		ļ.		. 3	ļ	Į	ļ	ļ	<u> </u>		0		(58)
Primary circ	•	•			59)m = ((58) ÷ 36	65 × (41)	ım			<u> </u>		()
(modified					•	. ,	, ,		r thermo	stat)			
(59)m= 23.2	6 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) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	equired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 216.1	5 190.52	200.12	179.43	175.87	157.18	151	165.64	165.33	186.06	196.69	210.96		(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)														
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)														
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)													
Output from water heater														
(64)m= 216.15 190.52 200.12 179.43 175.87 157.18 151 165.64 165.33 186.06 196.69 210.96														
Output from water heater (annual) ₁₁₂	2194.94 (64)													
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 $\times (46)$ m + (57) m + (59) m]														
(65)m= 96.06 85.2 90.73 83.07 82.67 75.67 74.4 79.27 78.38 86.06 88.81 94.34	(65)													
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heatin	g													
5. Internal gains (see Table 5 and 5a):														
Metabolic gains (Table 5), Watts														
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec														
(66)m= 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17	(66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
(67)m= 23.97 21.29 17.32 13.11 9.8 8.27 8.94 11.62 15.6 19.8 23.11 24.64	(67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
(68)m= 268.9 271.69 264.66 249.69 230.79 213.03 201.17 198.38 205.41 220.38 239.28 257.04	(68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
(69)m= 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02	(69)													
Pumps and fans gains (Table 5a)														
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)													
Losses e.g. evaporation (negative values) (Table 5)														
(71)m= -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14	(71)													
Water heating gains (Table 5)														
(72)m= 129.11 126.79 121.95 115.38 111.11 105.1 100 106.54 108.86 115.67 123.35 126.79	(72)													
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$														
(73)m= 490.04 487.82 471.98 446.23 419.76 394.46 378.16 384.59 397.92 423.9 453.79 476.52	(73)													
6. Solar gains:														
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.														
Orientation: Access Factor Area Flux g_ FF Ga														
	(W)													
Northeast 0.9x 0.77 x 3.49 x 11.28 x 0.63 x 0.77 =	12.03 (75)													
Northeast 0.9x 0.77 x 3.49 x 11.28 x 0.63 x 0.7 =	12.03 (75)													
Northeast 0.9x 0.77 x 3.49 x 22.97 x 0.63 x 0.7 =	24.5 (75)													
Northeast 0.9x 0.77 x 3.49 x 22.97 x 0.63 x 0.7 =	24.5 (75)													
Northeast 0.9x 0.77 x 3.49 x 41.38 x 0.63 x 0.7 =	44.13 (75)													
Northeast 0.9x 0.77 x 3.49 x 41.38 x 0.63 x 0.7 =	44.13 (75)													
Northeast 0.9x 0.77 x 3.49 x 67.96 x 0.63 x 0.7 =	72.48 (75)													
Northeast 0.9x 0.77 x 3.49 x 67.96 x 0.63 x 0.7 =	72.48 (75)													
Northwest	(75)													
Northeast 0.9x 0.77 x 3.49 x 91.35 x 0.63 x 0.7 =	97.43 (75)													

Nawthanat F		1		1		1				1		٦
Northeast _{0.9x}	0.77	X	3.49	X	97.38	X	0.63	X	0.7	=	103.87	(75)
Northeast _{0.9x}	0.77	X	3.49	Х	97.38	X	0.63	X	0.7	=	103.87	(75)
Northeast _{0.9x}	0.77	X	3.49	X	91.1	X	0.63	X	0.7] =	97.17	(75)
Northeast _{0.9x}	0.77	X	3.49	X	91.1	X	0.63	X	0.7	=	97.17	(75)
Northeast _{0.9x}	0.77	X	3.49	X	72.63	X	0.63	X	0.7	=	77.46	(75)
Northeast _{0.9x}	0.77	X	3.49	X	72.63	X	0.63	X	0.7	=	77.46	(75)
Northeast 0.9x	0.77	X	3.49	x	50.42	X	0.63	X	0.7	=	53.78	(75)
Northeast _{0.9x}	0.77	X	3.49	X	50.42	X	0.63	X	0.7	=	53.78	(75)
Northeast _{0.9x}	0.77	X	3.49	X	28.07	X	0.63	X	0.7	=	29.94	(75)
Northeast 0.9x	0.77	X	3.49	X	28.07	X	0.63	X	0.7	=	29.94	(75)
Northeast _{0.9x}	0.77	X	3.49	X	14.2	X	0.63	X	0.7	=	15.14	(75)
Northeast _{0.9x}	0.77	X	3.49	X	14.2	X	0.63	X	0.7	=	15.14	(75)
Northeast _{0.9x}	0.77	X	3.49	x	9.21	X	0.63	X	0.7	=	9.83	(75)
Northeast _{0.9x}	0.77	X	3.49	x	9.21	x	0.63	X	0.7	=	9.83	(75)
Southwest _{0.9x}	0.77	X	3.21	x	36.79		0.63	X	0.7	=	36.1	(79)
Southwest _{0.9x}	0.77	X	3.44	х	36.79		0.63	X	0.7] =	38.68	(79)
Southwest _{0.9x}	0.77	X	3.21	x	36.79		0.63	x	0.7] =	36.1	(79)
Southwest _{0.9x}	0.77	X	3.21	x	36.79		0.63	x	0.7] =	36.1	(79)
Southwest _{0.9x}	0.77	x	3.21	x	62.67	ĺ	0.63	x	0.7] =	61.48	(79)
Southwest _{0.9x}	0.77	x	3.44	x	62.67	j	0.63	x	0.7	j =	65.89	(79)
Southwest _{0.9x}	0.77	x	3.21	x	62.67	ĺ	0.63	x	0.7	j =	61.48	(79)
Southwest _{0.9x}	0.77	x	3.21	x	62.67	j	0.63	x	0.7] =	61.48	(79)
Southwest _{0.9x}	0.77	x	3.21	х	85.75	j	0.63	X	0.7	j =	84.12	(79)
Southwest _{0.9x}	0.77	x	3.44	x	85.75	j	0.63	x	0.7	j =	90.15	(79)
Southwest _{0.9x}	0.77	x	3.21	x	85.75	j	0.63	x	0.7] =	84.12	(79)
Southwest _{0.9x}	0.77	x	3.21	x	85.75	j	0.63	x	0.7	j =	84.12	(79)
Southwest _{0.9x}	0.77	x	3.21	x	106.25	j	0.63	x	0.7	j =	104.23	(79)
Southwest _{0.9x}	0.77	x	3.44	х	106.25	j	0.63	x	0.7	j =	111.7	(79)
Southwest _{0.9x}	0.77	x	3.21	х	106.25	j	0.63	x	0.7	j =	104.23	(79)
Southwest _{0.9x}	0.77	x	3.21	х	106.25	j	0.63	x	0.7	j =	104.23	(79)
Southwest _{0.9x}	0.77	x	3.21	x	119.01	j	0.63	X	0.7	j =	116.75	(79)
Southwest _{0.9x}	0.77	X	3.44	x	119.01	j	0.63	X	0.7	j =	125.12	(79)
Southwest _{0.9x}	0.77	X	3.21	x	119.01	į	0.63	X	0.7	j =	116.75	(79)
Southwest _{0.9x}	0.77	X	3.21	x	119.01	j	0.63	X	0.7	j =	116.75	(79)
Southwest _{0.9x}	0.77	X	3.21	x	118.15	İ	0.63	X	0.7	j =	115.91	(79)
Southwest _{0.9x}	0.77	X	3.44	x	118.15	į	0.63	x	0.7	=	124.21	(79)
Southwest _{0.9x}	0.77	X	3.21	x	118.15	ĺ	0.63	x	0.7	=	115.91	(79)
Southwest _{0.9x}	0.77	X	3.21	x	118.15	ĺ	0.63	x	0.7	=	115.91	(79)
Southwest _{0.9x}	0.77) x	3.21	X	113.91	ĺ	0.63	x	0.7	, =	111.75	(79)
Southwest _{0.9x}	0.77	X	3.44	x	113.91		0.63	x	0.7] =	119.75	(79)
Southwest _{0.9x}	0.77	X	3.21	X	113.91		0.63	x	0.7	=	111.75	(79)
L	<u> </u>	1		ı		ı			-			」 ''

Southwest _{0.9x}		1	0.04	1 .,	140.04	1	0.00	l		1	444.75	7(70)
Southwest _{0.9x}	0.77] X]	3.21	X 1	113.91] 1	0.63	X	0.7] = 1	111.75	(79)
Southwest _{0.9x}	0.77] X]	3.21	X	104.39] 1	0.63	X	0.7] =]	102.41	(79)
Southwest _{0.9x}	0.77	X	3.44	X	104.39] 1	0.63	X	0.7] =	109.75	(79)
<u> </u>	0.77	X	3.21	X	104.39] 1	0.63	X	0.7] = 1	102.41	(79)
Southwesto.9x	0.77	X	3.21	X	104.39] i	0.63	X	0.7] = 1	102.41	(79)
Southwest _{0.9x}	0.77	X	3.21	X	92.85] 1	0.63	X	0.7] =	91.09	(79)
Southwest _{0.9x}	0.77	X	3.44	X	92.85] 1	0.63	X	0.7] =	97.62	<u> </u> (79)
Southwest _{0.9x}	0.77	X	3.21	X	92.85] i	0.63	X	0.7] =	91.09	(79)
Southwest _{0.9x}	0.77	X	3.21	X	92.85	<u> </u>	0.63	X	0.7	=	91.09	(79)
Southwest _{0.9x}	0.77	X	3.21	X	69.27		0.63	X	0.7	=	67.95	(79)
Southwest _{0.9x}	0.77	X	3.44	X	69.27	<u> </u>	0.63	X	0.7	=	72.82	(79)
Southwest _{0.9x}	0.77	X	3.21	X	69.27	ļ	0.63	X	0.7	=	67.95	(79)
Southwest _{0.9x}	0.77	X	3.21	X	69.27	ļ	0.63	X	0.7	=	67.95	(79)
Southwest _{0.9x}	0.77	X	3.21	X	44.07	<u> </u>	0.63	X	0.7	=	43.23	(79)
Southwest _{0.9x}	0.77	X	3.44	X	44.07]	0.63	X	0.7	=	46.33	(79)
Southwest _{0.9x}	0.77	X	3.21	X	44.07		0.63	X	0.7	=	43.23	(79)
Southwest _{0.9x}	0.77	X	3.21	X	44.07		0.63	X	0.7	=	43.23	(79)
Southwest _{0.9x}	0.77	X	3.21	X	31.49]	0.63	x	0.7	=	30.89	(79)
Southwest _{0.9x}	0.77	X	3.44	X	31.49]	0.63	X	0.7	=	33.1	(79)
Southwest _{0.9x}	0.77	X	3.21	X	31.49]	0.63	X	0.7	=	30.89	(79)
Southwest _{0.9x}	0.77	X	3.21	X	31.49]	0.63	X	0.7	=	30.89	(79)
Northwest _{0.9x}	0.77	X	0.92	x	11.28	x	0.63	x	0.7	=	3.17	(81)
Northwest _{0.9x}	0.77	X	0.92	X	22.97	x	0.63	x	0.7	=	6.46	(81)
Northwest _{0.9x}	0.77	X	0.92	X	41.38	x	0.63	x	0.7	=	11.63	(81)
Northwest _{0.9x}	0.77	X	0.92	x	67.96	x	0.63	x	0.7	=	19.11	(81)
Northwest _{0.9x}	0.77	X	0.92	X	91.35	x	0.63	x	0.7	=	25.68	(81)
Northwest _{0.9x}	0.77	X	0.92	X	97.38	x	0.63	x	0.7	=	27.38	(81)
Northwest _{0.9x}	0.77	X	0.92	x	91.1	x	0.63	x	0.7	=	25.61	(81)
Northwest _{0.9x}	0.77	X	0.92	X	72.63	x	0.63	x	0.7	=	20.42	(81)
Northwest 0.9x	0.77	X	0.92	x	50.42	x	0.63	x	0.7	=	14.18	(81)
Northwest _{0.9x}	0.77	X	0.92	x	28.07	x	0.63	x	0.7	=	7.89	(81)
Northwest _{0.9x}	0.77	x	0.92	x	14.2	x	0.63	x	0.7	=	3.99	(81)
Northwest 0.9x	0.77	X	0.92	x	9.21	x	0.63	x	0.7] =	2.59	(81)
Rooflights _{0.9x}	1	X	2.22	x	26	x	0.63	x	0.7	=	22.95	(82)
Rooflights _{0.9x}	1	X	0.75	x	26	х	0.63	x	0.7	j =	7.7	(82)
Rooflights _{0.9x}	1	x	0.65	x	26	x	0.63	x	0.7	j =	6.67	(82)
Rooflights _{0.9x}	1	X	2.22	x	54	x	0.63	x	0.7	j =	47.67	(82)
Rooflights _{0.9x}	1	X	0.75	x	54	x	0.63	x	0.7	j =	15.98	(82)
Rooflights _{0.9x}	1	×	0.65	×	54	×	0.63	x	0.7	j =	13.86	(82)
Rooflights _{0.9x}	1	X	2.22	×	96	x	0.63	x	0.7	j =	84.74	(82)
Rooflights _{0.9x}	1	X	0.75	X	96	X	0.63	x	0.7	=	28.41	(82)
L		_						ı				

Rooflights _{0.9x}	1	x	0.65	x		96] x	0.63	×	0.7		24.64	(82)
Rooflights _{0.9x}	1	x	2.22	x		150	X	0.63	x	0.7		132.4	(82)
Rooflights 0.9x	1	X	0.75	x		150	X	0.63	x	0.7		44.4	(82)
Rooflights _{0.9x}	1	X	0.65	x		150	X	0.63	x	0.7	-	38.5	(82)
Rooflights _{0.9x}	1	x	2.22	x		192	X	0.63	x	0.7	=	169.48	(82)
Rooflights _{0.9x}	1	X	0.75	x		192	X	0.63	×	0.7		56.83	(82)
Rooflights 0.9x	1	x	0.65	x		192	x	0.63	x	0.7	=	49.28	(82)
Rooflights _{0.9x}	1	x	2.22	x		200	x	0.63	x	0.7		176.54	(82)
Rooflights _{0.9x}	1	X	0.75	X		200	x	0.63	x	0.7		59.2	(82)
Rooflights 0.9x	1	X	0.65	x		200	x	0.63	x	0.7	=	51.34	(82)
Rooflights _{0.9x}	1	X	2.22	X		189	x	0.63	х	0.7	=	166.83	(82)
Rooflights _{0.9x}	1	X	0.75	X		189	x	0.63	x	0.7	=	55.94	(82)
Rooflights _{0.9x}	1	Х	0.65	X		189	x	0.63	x	0.7	=	48.51	(82)
Rooflights _{0.9x}	1	X	2.22	X		157	x	0.63	x	0.7	=	138.58	(82)
Rooflights 0.9x	1	X	0.75	X		157	X	0.63	X	0.7	=	46.47	(82)
Rooflights 0.9x	1	X	0.65	X		157	x	0.63	x	0.7	=	40.3	(82)
Rooflights _{0.9x}	1	X	2.22	X		115	X	0.63	X	0.7	=	101.51	(82)
Rooflights _{0.9x}	1	X	0.75	X		115	X	0.63	X	0.7	=	34.04	(82)
Rooflights 0.9x	1	Х	0.65	X		115	X	0.63	x	0.7	=	29.52	(82)
Rooflights 0.9x	1	X	2.22	X		66	x	0.63	X	0.7	=	58.26	(82)
Rooflights _{0.9x}	1	X	0.75	X		66	X	0.63	X	0.7	=	19.53	(82)
Rooflights _{0.9x}	1	X	0.65	X		66	X	0.63	x	0.7	=	16.94	(82)
Rooflights _{0.9x}	1	X	2.22	X		33	X	0.63	X	0.7	=	29.13	(82)
Rooflights 0.9x	1	X	0.75	X		33	X	0.63	X	0.7	=	9.77	(82)
Rooflights 0.9x	1	X	0.65	X		33	х	0.63	X	0.7	=	8.47	(82)
Rooflights _{0.9x}	1	X	2.22	X		21	x	0.63	X	0.7	=	18.54	(82)
Rooflights _{0.9x}	1	X	0.75	X		21	X	0.63	X	0.7	=	6.22	(82)
Rooflights 0.9x	1	X	0.65	X		21	X	0.63	X	0.7	=	5.39	(82)
Solar gains in v					20110	0.40.00		n = Sum(74)m		057.00	470.40	1	(02)
(83)m= 211.53 Total gains – ir	383.3	580.22			994.13	946.23	817	.67 657.68	439.1	3 257.68	178.16		(83)
(84)m= 701.56	871.12		` 		388.59		1203	2.26 1055.61	863.0	3 711.46	654.68	1	(84)
` '	ļ				000.00	1024.00	1202	1000.01		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	004.00	J	(0.)
7. Mean interr		`			ı oroo i	from Tol	hlo O	Th1 (°C)				24	(85)
Utilisation fact	•	•		_			DIC 3	, 1111 (C)				21	(00)
Jan	Feb	Mar		May	Jun	Jul	Δ	ug Sep	Oct	Nov	Dec	1	
(86)m= 1	0.99	0.98).78	0.59	0.44	0.5		0.96	0.99	1	1	(86)
	I								0.00	0.00	<u> </u>	J	(3.5)
Mean internal (87)m= 19.64	tempera 19.85	20.18		<u> </u>	ow ste 20.97	ps 3 to 1 20.99	/ IN I	<u> </u>	20.5	19.99	19.6	1	(87)
` '	<u> </u>						<u> </u>	Į.	20.5	13.33	19.0	J	(01)
Temperature			1				1	<u> </u>	140.00	140.07	40.07	1	(00)
(88)m= 19.86	19.86	19.86	19.88	9.88	19.89	19.89	19.	89 19.88	19.88	19.87	19.87	J	(88)

Litilicat	tion foo	tor for a	ains for i	ract of d	volling k	2 m (cc	o Tablo	00)						
(89)m=	1	0.99	0.97	0.89	0.72	0.5	0.33	0.39	0.68	0.94	0.99	1		(89)
` ′ L					ļ.						0.99	1		(00)
Mean (90)m=	18.06	temper	ature in	the rest	of dwelli	ng 12 (fo	19.89	19.89	/ IN Tabl	e 9c) 19.32	18.58	18.01		(90)
(90)111=	10.00	10.57	10.04	13.4	13.74	19.07	19.09	19.09		LA = Livin			0.33	(91)
											J (, I	0.00	
Г	1		ature (fo		1				_					(00)
(92)m=	18.57	18.86	19.28	19.79	20.11	20.23	20.25	20.25	20.17	19.71	19.05	18.53		(92)
	18.57	18.86	he mean 19.28	19.79	tempera 20.11	20.23	m Table	4e, wne	20.17	·	19.05	10.52		(93)
(93)m=					20.11	20.23	20.25	20.25	20.17	19.71	19.05	18.53		(93)
			uirement		o obtoin	ad at at	on 11 of	Table Ok	th	tTim /	76\m an	d ro oolo	uloto	
			or gains			ed at ste	ер ттог	rable 90	o, so tha	it 11,m=(76)m an	d re-calc	uiate	
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat			ains, hm	:										
(94)m=	0.99	0.99	0.96	0.89	0.73	0.53	0.37	0.42	0.71	0.94	0.99	1		(94)
Г			, W = (9 ²				I			I		-		(0.7)
(/	697.76	858.84		1107.09		735.24	486.69	509.72	745.39	807.47	703.02	652.05		(95)
г			rnal tem											(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)
			an intern				- ` 		<u> </u>	-	4000 45	4000 00		(07)
` ′		1923.47			1139.58		489.47	515.05	817.08	1234.53		1960.92		(97)
·	948.47	715.44	ement fo 555.29	267.62	88.5	0	n = 0.02	24 X [(97))m – (95 0	317.74	664.87	973.79		
(90)111=	340.47	713.44	333.29	207.02	00.5	0				<u> </u>			4531.72	(98)
Space	hoatin	a roquir	ement in	k\\/\h/m2	lyoar			TOIA	l per year	(KVVII/yeai) = Sum(9	0)15,912 =](99)
•		• •			•							l	41.89	
			nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	heating	_	at from s	econdar	//supple	mentary	system					ı	0	(201)
	•		at from m			,	•	(202) = 1 -	- (201) =				1	(202)
	•		ng from	•	` ,			` '	02) × [1 –	(203)] =			1	(204)
			ace heat	•				(- / (- , [(/1			93.5	(206)
	•	-	ry/suppl			n evetam	n %						0	(208)
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	_
Space.			ement (c				Jui	Aug	Оер	Oct	INOV	Dec	KVVII/ye	aı
· -	948.47	715.44	555.29	267.62	88.5	0	0	0	0	317.74	664.87	973.79		
(211)m	_ ([(U6)		4)] } x 1											(211)
` <i>′</i> г	1014.41	765.17	593.89	286.23	94.66	0	0	0	0	339.83	711.09	1041.49		(211)
L	1014.41	700.17	000.00	200.23	34.00	0	· ·		I (kWh/yea				4846.76	(211)
Canan	h a a tim.	a f al /a		.) I.\\/\-/				. • • •	. ()	a., Ga(2	- 15,1012	l	4040.70	(211)
•		• '	econdar 00 ÷ (20		HUHHH									
(215)m=	0	0	00 - (20	0	0	0	0	0	0	0	0	0		
· ′ L	!		l				l	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
												l		

Water heating								
Output from water heater (calculated above) 216.15 190.52 200.12 179.43 175.87 1	57.18 151	165.64	165.33	186.06	196.69	210.96		
Efficiency of water heater							79.8	(216)
(217)m= 88.3 88.02 87.4 85.88 83.09	79.8 79.8	79.8	79.8	86.23	87.81	88.39		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
· · · · · · · · · · · · · · · · · · ·	96.97 189.22	207.56	207.18	215.77	223.99	238.67		
	-	Tota	I = Sum(2	19a) ₁₁₂ =			2590.18	(219)
Annual totals				k'	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							4846.76]
Water heating fuel used							2590.18	
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							423.36	(232)
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	r
Space heating (main system 1)	(211) x			0.2	16	=	1046.9	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	559.48	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1606.38	(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	=	219.73	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1865.03	(272)

TER =

(273)

25.41

		User Details:				
Assessor Name:	Su Lee	Stroma Nun	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	ersion:	Version	n: 1.0.4.16	
	Р	roperty Address: Unit 0	4			
Address :	138-140 Highgate Road, Hig	hgate, Highgate, NW5	1PB			
1. Overall dwelling dime	nsions:					
		Area(m²)	Av. Height(m)		Volume(m³))
Basement		41.19 (1a) x	2.7	(2a) =	111.21	(3a)
Ground floor		35.68 (1b) x	3.2	(2b) =	114.18	(3b)
First floor		32.25 (1c) x	4.65	(2c) =	149.96	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1r) 109.12 (4)				
Dwelling volume		(3a)+(3	b)+(3c)+(3d)+(3e)+	(3n) =	375.35	(5)
2. Ventilation rate:						
	main secondar heating heating	y other	total		m³ per hou	r
Number of chimneys	0 + 0	+ 0 =	0 x 4	0 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 2	20 =	0	(6b)
Number of intermittent fa	ns		4 x 1	0 =	40	(7a)
Number of passive vents			0 x 1	0 =	0	(7b)
Number of flueless gas fi	res		0 x 4	0 =	0	(7c)
				Air cha	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	40 ÷	÷ (5) =	0.11	(8)
-	een carried out or is intended, proceed			` ′ _		 `
Number of storeys in the	ne 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 cons	truction		0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding to	the greater wall area (after				
	loor, enter 0.2 (unsealed) or 0.	1 (sealed), else enter 0		Г	0	(12)
If no draught lobby, ent	,	(<u> </u>	0	(13)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped			-	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	-	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	-	0	(16)
	q50, expressed in cubic metre	s per hour per square r	netre of envelope	area [5	(17)
•	ity value, then $(18) = [(17) \div 20] + (8)$				0.36	(18)
·	s if a pressurisation test has been don		√ is being used	L	0.50	
Number of sides sheltere			•	Г	2	(19)
Shelter factor		(20) = 1 - [0.075 x]	(19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter factor	(21) = (18) x (20) =		Ī	0.3	(21)
Infiltration rate modified for	or monthly wind speed			L		_
	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
				_					<u>!</u>				
Adjusted infiltra			<u> </u>			` 	`	`	I	0.04			
0.39 Calculate effec	0.38 ctive air	0.37 Change	0.33 rate for t	0.33 he appli	0.29 Cable ca	0.29 S e	0.28	0.3	0.33	0.34	0.36		
If mechanica		-			- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(23b)
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =			İ	0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (2	2b)m + (23b) × [1	– (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		ı	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				-	-								
if (22b)m		·	<u> </u>	, ,	<u> </u>	· ` `	ŕ	ŕ	· ` ·	i e		ı	(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(24d)m = 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air			<u> </u>			<u> </u>	<u> </u>	<u> </u>					
(25)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
							•	•	•			l	
3 Heat Insses	s and he	at lose r	naramete	ar.									
3. Heat losses		•			Net Ar	ea	U-valı	ıe	AXU		k-value		AXk
3. Heat losses ELEMENT	s and he Gros area	ss	oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros	ss	Openin	gs		n²				<)			
ELEMENT	Gros area	ss	Openin	gs	A ,r	m² x	W/m2	K =	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m ² x x 1/2	W/m2	= 0.04] =	(W/I 2.46	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	ss	Openin	gs	A ,r 2.46 3.24	m ² x x1/2 x1/2	W/m2 1 /[1/(1.4)+	0.04] = 0.04] =	2.46 4.3	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	ss	Openin	gs	A ,r 2.46 3.24 3.47	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.46 4.3 4.6	<) 			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.46 4.3 4.6 1.23	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/l 2.46 4.3 4.6 1.23 4.3	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.52	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.67	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5 6 7	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3				kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type	Gros area 1 2 3 4 5 6 7 e 1	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 3.52	x1/2 x1/2 x1/46 x1	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.67				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 2.2454 0.75292	x1/2 x1/2 x1/46 x1	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) +	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3 4.67 3.81728	2			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 3.52 0.75292 0.65298	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3 4.67 3.81728 1.27997	997			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	es (m²)	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 2.245 0.75292 0.65298 41.19	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3 4.67 3.81728 1.27997 1.11007	997			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin m	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 3.52 0.75292 0.65298 41.19	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.67 3.81728 1.27997 1.11007 5.3547	997			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 3	Openin m	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 2.245 0.75292 0.65298 41.19 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3 4.67 3.81728 1.27997 1.11007 5.3547 1.85 0.33	997			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3 10.2 1.38	9 3 5	0 3.24 0.93	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 0.75292 0.65298 41.19 10.29 1.84 0.42	x1/2 x1/2 x1/46 x1	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3 4.67 3.81728 1.27997 1.11007 5.3547 1.85 0.33 0.08	997			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 3	Openin m	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.52 3.24 2.245 0.75292 0.65298 41.19 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.67 4.3 4.67 3.81728 1.27997 1.11007 5.3547 1.85 0.33	997			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

W =		-
Walls Type6 0.8 0 0.8 × 0.18 = 0.14	╡	(29)
Walls Type7 0.96 0 0.96 x 0.18 = 0.17	_	(29)
Walls Type8 6.62 0 6.62 x 0.18 = 1.19	_	(29)
Walls Type9 4.96 0 4.96 x 0.18 = 0.89		(29)
Walls Type10 5.76 3.24 2.52 x 0.18 = 0.45	」	(29)
Walls Type11 0.42 × 0.18 = 0.08		(29)
Walls Type12 6.4 0 6.4 x 0.18 = 1.15		(29)
Walls Type13 9.11 3.52 5.59 x 0.18 = 1.01		(29)
Walls Type14 1.86 0 1.86 x 0.18 = 0.33		(29)
Walls Type15 8.6 2.46 6.14 x 0.18 = 1.11		(29)
Walls Type16 9.3 0 9.3 x 0.18 = 1.67		(29)
Walls Type17 0.6 0 0.6 x 0.18 = 0.11		(29)
Walls Type18 8.37 3.24 5.13 x 0.18 = 0.92		(29)
Roof Type1 31.76 3 28.76 x 0.13 = 3.74		(30)
Roof Type2 3.67 0.65 3.02 x 0.13 = 0.39		(30)
Total area of elements, m ²		(31)
Party wall 29.65 x 0 = 0	\neg	(32)
Party wall 28.67 x 0 = 0	7 ==	(32)
Party wall 33.12 x 0 = 0	7 -	(32)
Party wall 34.08 x 0 = 0	5 ==	(32)
Party wall 38.73 x 0 = 0	<u> </u>	(32)
Party wall 40 x 0 = 0	i	(32)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph ** include the areas on both sides of internal walls and partitions	1 3.2	_
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$	58.11	(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 1f		_
can be used instead of a detailed calculation. Thermal bridges: S (L x V) calculated using Appendix K		7(20)
Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.15 x (31)	9.91	(36)
Total fabric heat loss (33) + (36) =	68.02	(37)
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$		_
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
(38)m= 71.18 70.82 70.47 68.82 68.51 67.07 67.07 66.8 67.62 68.51 69.13 69.79		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m		
(39)m= 139.2 138.84 138.49 136.84 136.53 135.09 135.09 134.82 135.64 136.53 137.15 137.81		
Average = Sum(39) ₁₁₂ /12=	136.84	(39)
Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)	1	
(40)m= 1.28 1.27 1.27 1.25 1.25 1.24 1.24 1.24 1.25 1.25 1.26 1.26 Average = Sum(40) ₁₁₂ /12=	1.25	(40)
Number of days in month (Table 1a)	1.20	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		

(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
	ned occu					/						81		(42)
	·A > 13.9 ·A £ 13.9		+ 1./6 x	: [1 - exp	0.0003	349 x (11	-A -13.9)2)] + 0.0	0013 x (TFA -13.	9)			
					es per da					se target o		0.92		(43)
					ater use, l	_	-	o acriieve	a water us	se largel of	ı			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	ı litres pei	r day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
(44)m=	111.02	106.98	102.94	98.91	94.87	90.83	90.83	94.87	98.91	102.94	106.98	111.02		٦
Energy (content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600		Total = Sui oth (see Ta			1211.09	(44)
(45)m=	164.63	143.99	148.59	129.54	124.3	107.26	99.39	114.05	115.41	134.5	146.82	159.44		
If instan	tanoous w	ator hoati	ng at pain	of uso (no	o hot water	r storago)	ontor O in	hoves (16		Total = Su	m(45) ₁₁₂ =	=	1587.93	(45)
(46)m=	24.7	21.6	22.29	19.43	18.64	16.09	14.91	17.11	17.31	20.18	22.02	23.92		(46)
· /	storage		22.29	19.43	10.04	10.09	14.91	17.11	17.31	20.10	22.02	23.92		(40)
Storag	e volum	e (litres)) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	_			velling, e			, ,	a\ a.m.t.	- " (O! : (47\			
	vise ii no storage		not wate	er (this ir	iciudes i	nstantar	ieous co	ווסט ומוזונ	ers) ente	er '0' in (47)			
	•		eclared I	oss fact	or is kno	wn (kWh	n/day):				1	.7		(48)
Tempe	erature fa	actor fro	m Table	2b							0.	54		(49)
			r storage	-				(48) x (49)) =		0.	92		(50)
•				-	loss fact le 2 (kW							0		(51)
	-	-	see secti	on 4.3	,								, •	
	e factor		ble 2a m Table	2h								0		(52)
•			rstorage		oor			(47) x (51)) x (52) x (53) =		0	 	(53) (54)
	(50) or (_	,, IXVVII/ y	Cai			(11) x (01)) X (02) X (00) –	-	92		(55)
Water	storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m=	28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(57)
	-	•	nnual) fro									0		(58)
	•				month (•	` '	, ,		r thermo	ctat)			
(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>	(61)m =	<u> </u>	<u> </u>	<u> </u>	ļ -				I	
(61)m=	0	0	0	0	0	0 - 30	0	0	0	0	0	0		(61)
				<u> </u>		<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>		(59)m + (61)m	
(62)m=	216.38	190.73	200.33	179.62	176.04	157.34	151.14	165.8	165.49	186.25	196.9	211.19		(62)

Solar DHW input of	alculated	using App	endix G o	r Appendix	κ Η (negati	ve quantity	y) (ent	er '0' if no s	olar contrib	ution to wat	er heating)		
(add additional	lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pend	lix G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter			•			•				•	
(64)m= 216.38	190.73	200.33	179.62	176.04	157.34	151.14	165	.8 165.4	9 186.2	5 196.9	211.19		
				!		!		Output from	water hea	ter (annual)	112	2197.2	(64)
Heat gains fror	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (6	1)m] + 0.8	8 x [(46)r	n + (57)m	ı + (59)m]	
(65)m= 96.14	85.27	90.8	83.13	82.73	75.73	74.44	79.	32 78.44	4 86.12	88.88	94.41		(65)
include (57)r	m in calc	culation of	of (65)m	only if c	ylinder i	s in the	dwell	ing or hot	water is	from com	nmunity h	eating	
5. Internal ga	ins (see	Table 5	and 5a):									
Metabolic gain	s (Table	5) Wat	ts	,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aı	ug Se	p Oct	Nov	Dec		
(66)m= 140.47	140.47	140.47	140.47	140.47	140.47	140.47	140		_	7 140.47	140.47		(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee Table	5			ı	
(67)m= 24.1	21.4	17.41	13.18	9.85	8.32	8.99	11.0			23.23	24.77		(67)
Appliances gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	also see T	Table 5	!		l	
(68)m= 270.29	273.09	266.02	250.98	231.98	214.13	202.21	199			2 240.51	258.36		(68)
Cooking gains	(calcula	ted in A	ppendix	L. egua	tion L15	or L15a). als	o see Tab	ole 5		1		
(69)m= 37.05	37.05	37.05	37.05	37.05	37.05	37.05	37.0	1		37.05	37.05		(69)
Pumps and far	ns gains	(Table 5	 5а)	<u> </u>	<u> </u>	<u> </u>	<u> </u>	I	!	_!		l	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)		<u> </u>	<u> </u>		<u>!</u>	!	l	
(71)m= -112.38		-112.38	-112.38	-112.38	-112.38	-112.38	-112	.38 -112.3	8 -112.3	8 -112.38	-112.38		(71)
Water heating				l .		l .		!			1	I	
(72)m= 129.22	126.89	122.05	115.46	111.19	105.17	100.06	106	61 108.9	4 115.7	5 123.44	126.9		(72)
Total internal			Į	l	(66	l)m + (67)m	1 + (68	!	!	 (71)m + (72	. l !)m	l	
(73)m= 491.74			447.76	421.16	395.76	379.39	385	83 399.2	3 425.3	1 455.33	478.16		(73)
6. Solar gains													
Solar gains are c		using sola	r flux from	Table 6a	and assoc	iated equa	tions t	o convert to	the applic	able orienta	tion.		
Orientation: A		actor	Area		Flu			g_		FF		Gains	
Т	able 6d		m²		Ta	ble 6a		Table 6	3b	Table 6c		(W)	
Northeast _{0.9x}	0.77	X	3.5	52	X	1.28	X	0.63	X	0.7	=	12.14	(75)
Northeast 0.9x	0.77	Х	3.5	52	X	1.28	X	0.63	x	0.7	=	12.14	(75)
Northeast _{0.9x}	0.77	x	3.5	52	x 2	22.97	x	0.63	X	0.7	=	24.71	(75)
Northeast _{0.9x}	0.77	x	3.5	52	x 2	22.97	x	0.63	×	0.7		24.71	(75)
Northeast _{0.9x}	0.77	X	3.5	52	X Z	11.38	х	0.63	X	0.7		44.51	(75)
Northeast _{0.9x}	0.77	X	3.5	52	X 2	11.38	X	0.63	x	0.7		44.51	(75)
Northeast _{0.9x}	0.77	х	3.5	52	x (67.96	x	0.63	х	0.7	=	73.1	(75)
Northeast _{0.9x}	0.77	x	3.5	52	x (67.96	X	0.63	X	0.7		73.1	(75)
Northeast _{0.9x}		=		==	=		: :		—		===		=
	0.77	X	3.5	52	X S	91.35	X	0.63	X	0.7	=	98.27	(75)
Northeast _{0.9x}	0.77	x x	3.5			91.35	x	0.63	x	0.7	= =	98.27 98.27	(75)

Northoast o.o.		1		1		1		1		1		7,75)
Northeast 0.9x	0.77	X	3.52	X	97.38	X	0.63	X	0.7] = 1	104.76	(75)
Northeast 0.9x	0.77	X	3.52	X	97.38	X	0.63	X	0.7	=	104.76	(75)
Northeast 0.9x	0.77	X	3.52	X	91.1	X	0.63	X	0.7] = 1	98	(75)
Northeast _{0.9x}	0.77	X	3.52	X	91.1	X	0.63	X	0.7	=	98	<u> </u> (75)
Northeast _{0.9x}	0.77	X	3.52	Х	72.63	X	0.63	X	0.7	=	78.13	(75)
Northeast _{0.9x}	0.77	X	3.52	X	72.63	X	0.63	X	0.7] =	78.13	(75)
Northeast 0.9x	0.77	X	3.52	X	50.42	X	0.63	X	0.7	=	54.24	(75)
Northeast _{0.9x}	0.77	X	3.52	X	50.42	X	0.63	X	0.7	=	54.24	(75)
Northeast _{0.9x}	0.77	X	3.52	Х	28.07	X	0.63	X	0.7	=	30.19	(75)
Northeast 0.9x	0.77	X	3.52	X	28.07	X	0.63	X	0.7	=	30.19	(75)
Northeast _{0.9x}	0.77	X	3.52	X	14.2	X	0.63	X	0.7	=	15.27	(75)
Northeast _{0.9x}	0.77	X	3.52	X	14.2	X	0.63	X	0.7	=	15.27	(75)
Northeast _{0.9x}	0.77	X	3.52	X	9.21	X	0.63	X	0.7	=	9.91	(75)
Northeast _{0.9x}	0.77	X	3.52	X	9.21	X	0.63	X	0.7	=	9.91	(75)
Southwest _{0.9x}	0.77	X	3.24	X	36.79		0.63	X	0.7	=	36.43	(79)
Southwest _{0.9x}	0.77	X	3.47	x	36.79		0.63	X	0.7	=	39.02	(79)
Southwest _{0.9x}	0.77	X	3.24	X	36.79		0.63	X	0.7	=	36.43	(79)
Southwest _{0.9x}	0.77	X	3.24	x	36.79		0.63	x	0.7	=	36.43	(79)
Southwest _{0.9x}	0.77	x	3.24	x	62.67]	0.63	x	0.7	=	62.06	(79)
Southwest _{0.9x}	0.77	X	3.47	x	62.67		0.63	X	0.7	=	66.46	(79)
Southwest _{0.9x}	0.77	X	3.24	х	62.67		0.63	x	0.7	=	62.06	(79)
Southwest _{0.9x}	0.77	x	3.24	x	62.67		0.63	x	0.7	=	62.06	(79)
Southwest _{0.9x}	0.77	x	3.24	x	85.75		0.63	x	0.7	=	84.91	(79)
Southwest _{0.9x}	0.77	X	3.47	x	85.75		0.63	x	0.7] =	90.94	(79)
Southwest _{0.9x}	0.77	x	3.24	x	85.75		0.63	x	0.7] =	84.91	(79)
Southwest _{0.9x}	0.77	x	3.24	x	85.75		0.63	x	0.7] =	84.91	(79)
Southwest _{0.9x}	0.77	X	3.24	x	106.25		0.63	x	0.7] =	105.21	(79)
Southwest _{0.9x}	0.77	x	3.47	x	106.25	j	0.63	x	0.7] =	112.68	(79)
Southwest _{0.9x}	0.77	х	3.24	x	106.25	j	0.63	x	0.7	j =	105.21	(79)
Southwest _{0.9x}	0.77	x	3.24	x	106.25	j	0.63	x	0.7	j =	105.21	(79)
Southwest _{0.9x}	0.77	х	3.24	х	119.01	j	0.63	х	0.7	j =	117.84	(79)
Southwest _{0.9x}	0.77	х	3.47	х	119.01	j	0.63	х	0.7	j =	126.21	(79)
Southwest _{0.9x}	0.77	х	3.24	х	119.01	j	0.63	х	0.7	j =	117.84	(79)
Southwest _{0.9x}	0.77	х	3.24	х	119.01	j	0.63	х	0.7	j =	117.84	(79)
Southwest _{0.9x}	0.77	х	3.24	х	118.15	j	0.63	х	0.7	j =	116.99	(79)
Southwest _{0.9x}	0.77	x	3.47	x	118.15	j	0.63	x	0.7	j =	125.3	(79)
Southwest _{0.9x}	0.77	x	3.24	x	118.15	į	0.63	x	0.7] =	116.99	(79)
Southwest _{0.9x}	0.77	X	3.24	x	118.15	ĺ	0.63	x	0.7	=	116.99	(79)
Southwest _{0.9x}	0.77	X	3.24	x	113.91	ί	0.63	X	0.7	=	112.79	(79)
Southwest _{0.9x}	0.77	X	3.47	×	113.91	ĺ	0.63	x	0.7	=	120.8	(79)
Southwest _{0.9x}	0.77	X	3.24	x	113.91	ĺ	0.63	X	0.7) =	112.79	(79)
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Southwest _{0.9x}	0.77	X	3.24	X	113.91		0.63	X	0.7	=	112.79	(79)
Southwest _{0.9x}	0.77	X	3.24	X	104.39		0.63	X	0.7	=	103.37	(79)
Southwest _{0.9x}	0.77	X	3.47	X	104.39		0.63	X	0.7	=	110.7	(79)
Southwest _{0.9x}	0.77	X	3.24	x	104.39		0.63	X	0.7	=	103.37	(79)
Southwest _{0.9x}	0.77	X	3.24	X	104.39		0.63	X	0.7	=	103.37	(79)
Southwest _{0.9x}	0.77	X	3.24	X	92.85]	0.63	X	0.7	=	91.94	(79)
Southwest _{0.9x}	0.77	X	3.47	X	92.85]	0.63	X	0.7	=	98.47	(79)
Southwest _{0.9x}	0.77	X	3.24	X	92.85		0.63	X	0.7	=	91.94	(79)
Southwest _{0.9x}	0.77	X	3.24	X	92.85		0.63	X	0.7	=	91.94	(79)
Southwest _{0.9x}	0.77	X	3.24	x	69.27		0.63	X	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	3.47	X	69.27]	0.63	X	0.7	=	73.46	(79)
Southwest _{0.9x}	0.77	X	3.24	x	69.27]	0.63	X	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	3.24	x	69.27]	0.63	x	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	3.24	x	44.07]	0.63	x	0.7	=	43.64	(79)
Southwest _{0.9x}	0.77	X	3.47	x	44.07]	0.63	x	0.7	=	46.74	(79)
Southwest _{0.9x}	0.77	X	3.24	x	44.07]	0.63	X	0.7	=	43.64	(79)
Southwest _{0.9x}	0.77	X	3.24	x	44.07		0.63	X	0.7	=	43.64	(79)
Southwest _{0.9x}	0.77	X	3.24	x	31.49		0.63	X	0.7	=	31.18	(79)
Southwest _{0.9x}	0.77	X	3.47	x	31.49		0.63	X	0.7	=	33.39	(79)
Southwest _{0.9x}	0.77	X	3.24	x	31.49		0.63	x	0.7	=	31.18	(79)
Southwest _{0.9x}	0.77	X	3.24	x	31.49		0.63	X	0.7	=	31.18	(79)
Northwest 0.9x	0.77	X	0.93	x	11.28	x	0.63	x	0.7] =	3.21	(81)
Northwest 0.9x	0.77	X	0.93	x	22.97	x	0.63	x	0.7] =	6.53	(81)
Northwest 0.9x	0.77	X	0.93	x	41.38	X	0.63	X	0.7	=	11.76	(81)
Northwest 0.9x	0.77	X	0.93	x	67.96	x	0.63	x	0.7] =	19.31	(81)
Northwest 0.9x	0.77	X	0.93	x	91.35	x	0.63	x	0.7] =	25.96	(81)
Northwest 0.9x	0.77	X	0.93	x	97.38	X	0.63	X	0.7	=	27.68	(81)
Northwest 0.9x	0.77	X	0.93	x	91.1	X	0.63	X	0.7	=	25.89	(81)
Northwest 0.9x	0.77	X	0.93	x	72.63	X	0.63	X	0.7	=	20.64	(81)
Northwest 0.9x	0.77	X	0.93	x	50.42	X	0.63	X	0.7	=	14.33	(81)
Northwest 0.9x	0.77	X	0.93	x	28.07	x	0.63	x	0.7] =	7.98	(81)
Northwest 0.9x	0.77	X	0.93	x	14.2	x	0.63	x	0.7] =	4.04	(81)
Northwest 0.9x	0.77	X	0.93	x	9.21	x	0.63	x	0.7] =	2.62	(81)
Rooflights 0.9x	1	X	2.25	x	26	x	0.63	x	0.7] =	23.17	(82)
Rooflights 0.9x	1	X	0.75	x	26	x	0.63	x	0.7] =	7.77	(82)
Rooflights 0.9x	1	X	0.65	x	26	x	0.63	x	0.7	=	6.74	(82)
Rooflights 0.9x	1	x	2.25	x	54	x	0.63	x	0.7] =	48.13	(82)
Rooflights _{0.9x}	1	x	0.75	x	54	x	0.63	x	0.7	j =	16.14	(82)
Rooflights _{0.9x}	1	x	0.65	x	54	x	0.63	x	0.7	j =	14	(82)
Rooflights 0.9x	1	x	2.25	x	96	x	0.63	x	0.7] =	85.56	(82)
Rooflights _{0.9x}	1	x	0.75	x	96	x	0.63	x	0.7	j =	28.69	(82)
_		_		-		- '		-		-		_

Rooflights 0.9x	1	x	0.65	×		96] x	0.63	×	0.7		24.88	(82)
Rooflights 0.9x	1	x	2.25	x		150] x	0.63	×	0.7	=	133.68	(82)
Rooflights 0.9x	1	X	0.75	×		150	X	0.63	x	0.7		44.83	(82)
Rooflights _{0.9x}	1	X	0.65	x		150	X	0.63	x	0.7		38.88	(82)
Rooflights _{0.9x}	1	X	2.25	×		192	x	0.63	x	0.7		171.11	(82)
Rooflights _{0.9x}	1	х	0.75	x		192	X	0.63	×	0.7	=	57.38	(82)
Rooflights 0.9x	1	х	0.65	x		192	x	0.63	x	0.7	=	49.76	(82)
Rooflights 0.9x	1	х	2.25	x		200	x	0.63	x	0.7	=	178.24	(82)
Rooflights 0.9x	1	х	0.75	x		200	x	0.63	х	0.7	=	59.77	(82)
Rooflights 0.9x	1	х	0.65	x		200	x	0.63	x	0.7	=	51.83	(82)
Rooflights 0.9x	1	х	2.25	x		189	x	0.63	x	0.7	=	168.44	(82)
Rooflights 0.9x	1	х	0.75	x		189	x	0.63	х	0.7	=	56.48	(82)
Rooflights 0.9x	1	х	0.65	x		189	x	0.63	x	0.7	=	48.98	(82)
Rooflights 0.9x	1	х	2.25	x		157	x	0.63	x	0.7	=	139.92	(82)
Rooflights 0.9x	1	х	0.75	x		157	x	0.63	x	0.7	=	46.92	(82)
Rooflights 0.9x	1	х	0.65	x		157	x	0.63	x	0.7	=	40.69	(82)
Rooflights 0.9x	1	х	2.25	x		115	x	0.63	x	0.7	=	102.49	(82)
Rooflights 0.9x	1	х	0.75	x		115	x	0.63	х	0.7	=	34.37	(82)
Rooflights 0.9x	1	х	0.65	x		115	x	0.63	x	0.7	=	29.8	(82)
Rooflights 0.9x	1	х	2.25	x		66	x	0.63	x	0.7	=	58.82	(82)
Rooflights 0.9x	1	х	0.75	x		66	x	0.63	x	0.7	=	19.72	(82)
Rooflights _{0.9x}	1	х	0.65	×		66	jx	0.63	×	0.7		17.11	(82)
Rooflights _{0.9x}	1	X	2.25	×		33	x	0.63	x	0.7		29.41	(82)
Rooflights _{0.9x}	1	X	0.75	×		33	x	0.63	x	0.7		9.86	(82)
Rooflights _{0.9x}	1	X	0.65	×		33	x	0.63	x	0.7		8.55	(82)
Rooflights _{0.9x}	1	х	2.25	x		21	X	0.63	×	0.7	=	18.72	(82)
Rooflights _{0.9x}	1	х	0.75	×		21	X	0.63	×	0.7		6.28	(82)
Rooflights _{0.9x}	1	X	0.65	×		21	X	0.63	×	0.7		5.44	(82)
L							_						
Solar gains in	watts, ca	alculated	for each n	nonth			(83)m	n = Sum(74)m	(82)m	_	,	_	
(83)m= 213.48	386.84	585.59			1003.32	954.97	825	.23 663.76	443.2	3 260.05	179.81		(83)
Total gains – i			<u> </u>		` '					_		٦	
(84)m= 705.22	876.36	1059.2	1258.97 14	101.65	1399.08	1334.37	1211	1.06 1062.99	868.5	715.38	657.97		(84)
7. Mean inter	nal temp	erature (heating se	eason)									
Temperature	during h	eating pe	eriods in th	ne living	g area t	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisation fac			ving area,	h1,m (see Ta	ble 9a)						٦	
Jan	Feb	Mar	Apr	May	Jun	Jul	А	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.92	0.78	0.59	0.44	0.	5 0.77	0.96	0.99	1		(86)
Mean interna	l temper	ature in I	iving area	T1 (foll	ow ste	ps 3 to 7	7 in T	able 9c)		_		_	
(87)m= 19.64	19.85	20.18	20.58	20.85	20.97	20.99	20.	99 20.9	20.5	19.99	19.6		(87)
Temperature	during h	eating pe	eriods in re	est of d	welling	from Ta	able 9	9, Th2 (°C)					
(88)m= 19.86	19.86	19.87	19.88 1	19.88	19.89	19.89	19.	89 19.89	19.88	19.87	19.87		(88)
		•										_	

Litilicat	tion foo	tor for a	aine for I	ract of d	volling l	n2 m (sc	o Tabla	00)						
(89)m=	1	0.99	ains for 0.97	0.89	0.72	0.5	0.33	9a) 0.39	0.68	0.94	0.99	1		(89)
			<u> </u>				<u> </u>		<u> </u>		0.99	'		(00)
Mean (90)m=	18.06	18.37	18.84	the rest	of dwelli	ng 12 (fo	ollow ste	ps 3 to 1	7 in Tabl	e 9c) 19.32	18.58	18.01		(90)
(90)111=	16.06	10.37	10.04	19.4	19.75	19.67	19.69	19.69	!	19.3∠ LA = Livin		ļ	0.22	(90)
										L/(- L/VII)	g aroa . (-	,, –	0.33	(91)
Г			ature (fo				r					ı 1		
(92)m=	18.58	18.86	19.28	19.79	20.11	20.23	20.25	20.25	20.17	19.71	19.05	18.54		(92)
							i		ere appro	·				(00)
(93)m=	18.58	18.86	19.28	19.79	20.11	20.23	20.25	20.25	20.17	19.71	19.05	18.54		(93)
			uirement											
			ernal ter or gains	•		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		
Utilisat			ains, hm	:					•					
(94)m=	0.99	0.99	0.96	0.89	0.73	0.53	0.37	0.42	0.71	0.94	0.99	1		(94)
			, W = (9 ²							1				
` ′	701.45	864.12		1115.39		741	490.56	513.76	751.11	812.92	707	655.37		(95)
г			rnal tem	· -			I		I			1		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
г							-``	- ,	– (96)m		4000.74	4075 07		(07)
` ′	1987.35		<u> </u>	1490.03		760.96	493.35	519.12	823.39	1243.9	1638.71	1975.67		(97)
·	956.71	721.58	559.95	269.74	89.1	0	$\ln = 0.02$	4 X [(97))m – (95 0	320.64	670.83	982.3		
(90)111=	930.71	721.30	339.93	209.74	09.1					<u> </u>		L	4570.85	(98)
Space	hootin	a roquir	omont in	k\Mb/m²	hioor			TOla	l per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡`
•		• •	ement in		•							l	41.89	(99)
			nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	heatir	_	at from s	acondan	//sunnle	mantary	evetem					ı	0	(201)
						memary	•	(202) = 1 -	_ (201) _			l I		╡``
			at from m	•	` '			` /	, ,	(000)]		ļ	1	(202)
			ng from	•				(204) = (2	02) x [1 –	(203)] =		ļ	1	(204)
Efficier	ncy of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficier	ncy of s	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	heatin	g require	ement (c	alculate	d above)									
	956.71	721.58	559.95	269.74	89.1	0	0	0	0	320.64	670.83	982.3		
(211)m	= {[(98])m x (20	(4)] } x 1	00 ÷ (20	06)									(211)
	1023.22	771.74	598.88	288.49	95.29	0	0	0	0	342.94	717.47	1050.59		
_	-		_	-	-		_	Tota	I (kWh/yea	ar) =Sum(2	211),,,,5,10,12	=	4888.61	(211)
Space	heating	g fuel (s	econdar	y), kWh/	month							•		
= {[(98 <u>)</u> 1	m x (20	1)]}x1	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)

Water heating								
Output from water heater (calculated above) 216.38	57.34 151.14	165.8	165.49	186.25	196.9	211.19		
Efficiency of water heater		1					79.8	(216)
(217)m= 88.32 88.03 87.41 85.9 83.1	79.8 79.8	79.8	79.8	86.25	87.83	88.4		」 (217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	'	'						
(219)m= 245.01 216.66 229.18 209.11 211.84 1	97.16 189.4	207.77	207.38	215.94	224.19	238.89		_
		Total	= Sum(2	19a) ₁₁₂ =			2592.53	(219)
Annual totals				k'	Wh/yeaı	•	kWh/year	1
Space heating fuel used, main system 1							4888.61]
Water heating fuel used							2592.53	
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							425.55	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x			0.2	16	=	1055.94	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	559.99	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1615.93	(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	=	220.86	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1875.71	(272)

TER =

(273)

25.33

		User Details:				
Assessor Name:	Su Lee	Stroma Num	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Versio	n: 1.0.4.16	
	Pr	operty Address: Unit 0	5			
Address :	138-140 Highgate Road, High	ngate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:					
_		Area(m²)	Av. Height(m)		Volume(m ³	_
Basement		41.06 (1a) x	2.7	(2a) =	110.86	(3a)
Ground floor		35.9 (1b) x	3.2	(2b) =	114.88	(3b)
First floor		32.25 (1c) x	4.65	(2c) =	149.96	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	109.21 (4)				
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	(3n) =	375.7	(5)
2. Ventilation rate:				_		
	main secondary heating heating	other	total		m³ per hou	r
Number of chimneys		+ 0 =	0 ×	40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 ×	20 =	0	(6b)
Number of intermittent fa	ns		4 ×	10 =	40	(7a)
Number of passive vents	3	Ī	0 x	10 =	0	(7b)
Number of flueless gas f	ires	Ī	0 x	40 =	0	(7c)
		_		Air ch	anges per ho	
Inditantian due to abise	fluor and face (60) (6b) (7c)		r		_
	ys, flues and fans = (6a)+(6b)+(7a neen carried out or is intended, proceed		40 (9) to (16)	÷ (5) =	0.11	(8)
Number of storeys in t		10 (117), 01110111100 0011111100 1		ſ	0	(9)
Additional infiltration	3 (1)		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame or	0.35 for masonry const	ruction		0	(11)
	resent, use the value corresponding to	the greater wall area (after		L		
deducting areas of openi	ngs);	l (sealed) else enter ()		Г	0	(12)
If no draught lobby, en	,	(Scalca), cloc criter o		<u> </u> 	0	(13)
•	s and doors draught stripped			l I		(14)
Window infiltration	o and doors draught shipped	0.25 - [0.2 x (14) ÷	1001 =	I I	0	(15)
Infiltration rate		(8) + (10) + (11) + (_	l I	0	(16)
	q50, expressed in cubic metres			l area [(17)
•	lity value, then $(18) = [(17) \div 20] + (8)$		lette of envelope	- area 	5	(17)
·	es if a pressurisation test has been done		ı is beina used	L	0.36	(10)
Number of sides sheltere		r er a aegree am permeaems,	.o zemg ueeu	ſ	2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	ļ	0.85	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18) x (20) =		Ţ	0.3	(21)
Infiltration rate modified	or monthly wind speed			L		
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp		· ·		_		
			 			

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
				_					!	<u> </u>			
Adjusted infiltra		<u> </u>				` 	r í	`	I	0.04			
0.39 Calculate effect	0.38 ctive air	0.37 Change	0.33 rate for t	0.33 he appli	0.29 Cable ca	0.29 S e	0.28	0.3	0.33	0.34	0.36		
If mechanica		-			- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(23b)
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	– (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole he				-	-								
if (22b)m		<u> </u>	<u> </u>	, ,	<u> </u>	· ` `	ŕ	i 	· ` ·				(0.4.)
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(24d)m = 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air						<u> </u>	<u> </u>	<u> </u>					
(25)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
							•		•	•			
3 Heat Insses	s and he	at loss i	naramete	or.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value		ΑΧk
3. Heat losses		SS	oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				<) 			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	=	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x 1/2	W/m2	eK = 0.04] =	(W/I 2.46	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 3.24	m ² x x1/2 x1/2	W/m2 1 /[1/(1.4)+	0.04] = 0.04] =	2.46 4.3	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area	SS	Openin	gs	A ,r 2.46 3.24 3.47	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.46 4.3 4.6	<) 			(26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.46 4.3 4.6 1.23	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/l 2.46 4.3 4.6 1.23 4.3	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 6	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.53	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.68	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 4 5 5 6 6 7	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3				kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 4 5 6 6 7 e 1	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 3.53	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3	3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 3.53 0.75361	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074	3399			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 3.53 2.24749 0.75361	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074 1.28113	3 9 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Floor	Gros area 1 2 2 3 4 4 5 6 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 2.24744 0.75361 0.65357	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074 1.28113 1.11107 5.3378	3 9 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Floor Walls Type1	Gros area 1 1 2 3 4 4 5 6 6 7 6 1 6 2 6 3	ss (m²)	Openin m	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 3.53 2.24749 0.75361 0.65357 41.06	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074 1.28113 1.11107 5.3378	3 9 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 1 6 2 6 3 5 .08	ss (m²)	Openin m	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 3.53 2.2474: 0.75361 0.65357 41.06 10.31	x1/2 x1/2 x1/4 x1/45 x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074 1.28113 1.11107 5.3378 1.86 0.33	3 9 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 1 2 2 3 3 4 4 5 6 6 7 6 1 7 6 2 6 3 5.08 5.08	ss (m²)	0 3.24 0.93	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 0.75361 0.65357 41.06 10.31 1.84 0.42	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074 1.28113 1.11107 5.3378 1.86 0.33 0.08	3 9 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (29) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 1 6 2 6 3 5 .08	ss (m²)	Openin m	gs ²	A ,r 2.46 3.24 3.47 0.93 3.24 3.53 3.24 3.53 2.2474: 0.75361 0.65357 41.06 10.31	x1	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.3 4.6 1.23 4.3 4.68 4.3 4.68 3.82074 1.28113 1.11107 5.3378 1.86 0.33	3 9 7			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8	X 0.18	= 0.14			(29)
Walls Type7 0.96 0	0.96	× 0.18	= 0.17			(29)
Walls Type8 6.75 0	6.75	X 0.18	= 1.22			(29)
Walls Type9 5 0	5	X 0.18	= 0.9			(29)
Walls Type10 5.76 3.24	2.52	0.18	= 0.45			(29)
Walls Type11 0.42 0	0.42	0.18	= 0.08			(29)
Walls Type12 6.4 0	6.4	X 0.18	= 1.15			(29)
Walls Type13 9.11 3.53	5.58	X 0.18	= 1			(29)
Walls Type14 1.86 0	1.86	X 0.18	= 0.33			(29)
Walls Type15 8.6 2.46	6.14	x 0.18	= 1.11			(29)
Walls Type16 9.3 0	9.3	x 0.18	= 1.67			(29)
Walls Type17 0.6 0	0.6	x 0.18	= 0.11			(29)
Walls Type18 8.37 3.24	5.13	x 0.18	= 0.92			(29)
Roof Type1 31.76 3	28.76	x 0.13	= 3.74			(30)
Roof Type2 3.34 0.65	2.69	x 0.13	= 0.35			(30)
Total area of elements, m ²	168.31					(31)
Party wall	30.19	x 0	= 0			(32)
Party wall	27.95	x 0	= 0			(32)
Party wall	33.7	x 0	= 0			(32)
Party wall	33.09	x 0	= 0			(32)
Party wall	38.73	x 0	= 0			(32)
Party wall	40	x 0	= 0			(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa		ng formula 1/[(1/U-	-value)+0.04] as given i	n paragraph	3.2	_
Fabric heat loss, W/K = S (A x U)		(26)(30) + (32	?) =	Г	58.11	(33)
Heat capacity Cm = S(A x k)		((2	28)(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	n kJ/m²K	In	dicative Value: Medium	י <u>ֿ</u>	250	(35)
For design assessments where the details of the construction	ction are not known	precisely the indica	ative values of TMP in	Table 1f		_
can be used instead of a detailed calculation. Thermal bridges: S(L x Y) calculated using A	ppendix K			Г	9.9	(36)
if details of thermal bridging are not known (36) = $0.15 \times ($				L	9.9	(00)
Total fabric heat loss		(3	33) + (36) =	[68.01	(37)
Ventilation heat loss calculated monthly		(3	$88)m = 0.33 \times (25)m \times (98)m $	5)		
Jan Feb Mar Apr May	Jun Jul	Aug Se	ep Oct Nov	Dec		
(38)m= 71.24 70.88 70.53 68.88 68.57	67.13 67.13	66.86 67.6	68 68.57 69.19	69.85		(38)
Heat transfer coefficient, W/K		(3	99)m = (37) + (38)m			
(39)m= 139.26 138.9 138.54 136.89 136.58	135.14 135.14	4 134.87 135		1		_
Heat loss parameter (HLP), W/m²K		(4	Average = Sum(39) (40) m = (39) m \div (4)) ₁₁₂ /12=	136.89	(39)
(40)m= 1.28 1.27 1.27 1.25 1.25	1.24 1.24	1.23 1.2	1.25	1.26		
Number of days in month (Table 1a)			Average = Sum(40)) ₁₁₂ /12=	1.25	(40)
Jan Feb Mar Apr May	Jun Jul	Aug Se	ep Oct Nov	Dec		
		<u> </u>				

(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	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		81		(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).94		(43)
Jan Hot water usage i	Feb	Mar day for or	Apr	May	Jun	Jul Table 10 X	Aug	Sep	Oct	Nov	Dec		
	· ·		1			1	· <i>'</i>	00.00	100.00	100.00	111 00]	
(44)m= 111.03	106.99	102.96	98.92	94.88	90.84	90.84	94.88	98.92	102.96 Fotal = Sui	106.99	111.03	1211.25	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600			. ,		1211.23](++)
(45)m= 164.66	144.01	148.6	129.56	124.31	107.27	99.4	114.07	115.43	134.52	146.84	159.46		
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =		1588.14	(45)
(46)m= 24.7	21.6	22.29	19.43	18.65	16.09	14.91	17.11	17.31	20.18	22.03	23.92		(46)
Water storage					/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	-1	70. 1		1			I	
Storage volum	` ′		•			•		ame ves	sei		150		(47)
If community h Otherwise if no	•			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			. (0.0, 0	. • (,			
a) If manufact	urer's d	eclared I	oss facto	or is kno	wn (kWh	n/day):				1	.7		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-		or ic not		(48) x (49)) =		0.	92		(50)
Hot water stor			-								0		(51)
If community h	eating s	ee secti	on 4.3			• /							
Volume factor			0.1								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	` , `	,	for each	month			((56)m = ((55) × (41)ı	m	0.	92		(55)
(56)m= 28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(56)
If cylinder contains												 lix H	(00)
(57)m= 28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(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 Tab	le H5 if t	here is s	solar 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 ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m			,		•	
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
<u>.</u>			<u> </u>				<u> </u>				<u> </u>	(59)m + (61)m	
(62)m= 216.4	190.75	200.35	179.63	176.06	157.35	151.15	165.81	165.51	186.27	196.92	211.21		(62)

Company Comp	Solar DHW input	calculated	using App	endix G oı	r Appendix	ι Η (nega	ntive quantit	y) (ent	ter '0'	if no solar	contrib	ution to wate	er heating)		
Output from water heater (64)m= 216.4 190.75 200.35 179.63 176.06 157.35 151.15 166.81 165.51 196.27 196.92 211.21 Output from water heating, kWh/month 0.25 10.85 x (45)m + (61)m + (0.7)m + (1.7)m +	(add additiona	al lines if	FGHRS	and/or \	NWHRS	applie	s, see Ap	pend	dix G	3)					
(64)	(63)m= 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)ms 96;15 85;27 90;81 83;14 82;73 75;73 74;5 79;2 78;44 86;13 86;86 94;42 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from zomunity heating S. Internal gains (see Table 5 and 52;**) S. Internal gains (see Tab	Output from w	ater hea	ter		-		=			-		=	-	-	
Heat gains from water heating, kWhi/month 0.25 * [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] * (65)m = 96.15	(64)m= 216.4	190.75	200.35	179.63	176.06	157.3	151.15	165	5.81	165.51	186.27	196.92	211.21		
(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), Watis Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec						•	•		Outp	ut from wa	iter hea	ter (annual) ₁	12	2197.41	(64)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating Secondary Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	+ (6	31)m] + 0.8 x	[(46)r	n + (57)m	+ (59)m	n]		
Metabolic gains (Table 5), Watts	(65)m= 96.15	85.27	90.81	83.14	82.73	75.73	74.45	79.	.32	78.44	86.13	88.89	94.42		(65)
Metabolic gains (Table 5), Wats Jan	include (57)	m in cald	culation of	of (65)m	only if c	ylinde	is in the	dwell	ling o	or hot wa	ater is	from com	munity h	neating	
Second Feb Mar	5. Internal g	ains (see	e Table 5	and 5a):										
Cocking 140.5 14	Metab <u>olic gair</u>	ns (Table	5), Wat	ts										_	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 24.11	Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
CF) me	(66)m= 140.5	140.5	140.5	140.5	140.5	140.5	140.5	140	0.5	140.5	140.5	140.5	140.5		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 270.42 273.22 266.15 251.1 232.09 214.23 202.3 199.5 206.57 221.62 240.62 258.48 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.05 37.0	Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	see T	Table 5					
(68)me 270.42 273.22 266.15 251.1 232.09 214.23 202.3 199.5 206.57 221.62 240.62 258.48 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)me 37.05 37.	(67)m= 24.11	21.41	17.41	13.18	9.85	8.32	8.99	11.	.69	15.68	19.91	23.24	24.78		(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 (69) Pumps and fans gains (Table 5a) (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a),	also	see Tab	ole 5	-	-	-	
Company Comp	(68)m= 270.42	273.22	266.15	251.1	232.09	214.23	3 202.3	199	9.5	206.57	221.62	2 240.62	258.48		(68)
Pumps and fans gains (Table 5a) (70)m= 3	Cooking gains	s (calcula	ted in A	opendix	L, equa	tion L1	5 or L15a), als	o se	e Table	5			-	
Columbia Columbia	(69)m= 37.05	37.05	37.05	37.05	37.05	37.05	37.05	37.	.05	37.05	37.05	37.05	37.05		(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -112.4	Pumps and fa	ns gains	(Table 5	ā)		•	•		•				•	-	
Water heating gains (Table 5)	(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Water heating gains (Table 5) (72)m= 129.23	Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)	•	•	•			•		•	
Total internal gains =	(71)m= -112.4	-112.4	-112.4	-112.4	-112.4	-112.4	-112.4	-11	2.4	-112.4	-112.4	-112.4	-112.4]	(71)
Total internal gains =	Water heating	gains (T	able 5)		•	•		•	•	,		•	•	•	
(73)m= 491.9 489.68 473.77 447.9 421.3 395.89 379.51 385.95 399.35 425.45 455.47 478.32 (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 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 667.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 91.35 x 0.63 x 0.7 = 73.31 (75)	(72)m= 129.23	126.9	122.05	115.47	111.2	105.18	3 100.07	106	5.62	108.95	115.76	123.45	126.91]	(72)
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d m² Flux Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75)	Total interna	l gains =			•	(6	6)m + (67)n	n + (68	8)m +	· (69)m + (70)m +	(71)m + (72)	m	•	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area m² Flux Table 6a Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.77	(73)m= 491.9	489.68	473.77	447.9	421.3	395.89	379.51	385	.95	399.35	425.45	455.47	478.32]	(73)
Orientation: Access Factor Table 6d Area m² Flux Table 6a g_ Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 91.35 0.63 x 0.7 = 73.31 (75)	6. Solar gain	s:					·		<u> </u>			·			
Table 6d m² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 11.28 x 0.63 x 0.7 = 12.17 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 22.97 x 0.63 x 0.7 = 24.78 (75) Northeast 0.9x 0.77 x 3.53 x 41.38 x 0.63 x 0.7 = 44.64 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 67.96 x 0.63 x 0.7 = 73.31 (75) Northeast 0.9x 0.77 x 3.53 x 91.35 0.63 x 0.7 = 98.55 (75)	Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	tions	to co	nvert to the	e applic	able orientat	ion.		
Northeast 0.9x									_						
Northeast 0.9x	_	Table 6d					able 6a	_	l a	able 6b		Table 6c		(VV)	
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.5	53	x	11.28	X		0.63	X	0.7	=	12.17	(75)
Northeast 0.9x	Northeast 0.9x	0.77	X	3.5	53	x	11.28	X		0.63	X	0.7	=	12.17	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.5	53	X	22.97	X		0.63	X	0.7	=	24.78	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	х	3.5	53	x	22.97	X		0.63	X	0.7	=	24.78	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	х	3.5	53	x	41.38	x		0.63	x	0.7	=	44.64	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.5	53	x	41.38	x		0.63	x	0.7	=	44.64	(75)
Northeast 0.9x 0.77 x 3.53 x 91.35 x 0.63 x 0.7 = 98.55 (75)	Northeast _{0.9x}	0.77	х	3.5	53	x	67.96	x		0.63	x	0.7	=	73.31	(75)
0.1. 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Northeast _{0.9x}	0.77	X	3.5	53	x	67.96	x		0.63	x	0.7	=	73.31	(75)
	Northeast _{0.9x}	0.77	X	3.5	53	x	91.35	x		0.63	x	0.7	=	98.55	(75)
Northeast 0.9x 0.77 x 3.53 x 91.35 x 0.63 x 0.7 = 98.55 (75)	Northeast _{0.9x}	0.77	X	3.5	53	x	91.35	x		0.63	X	0.7	=	98.55	(75)

Northeast _{0.9x}	0.77	x	2.52	x	07.20] _x	0.62	x	0.7	1 =	105.06	(75)
Northeast 0.9x	0.77	J 1	3.53	! !	97.38] 1	0.63] 1	105.06	(75)
Northeast 0.9x	0.77] x] ,	3.53	X	97.38] X] v	0.63	X	0.7] = 1 _	105.06	(75)
Northeast 0.9x	0.77] x] x	3.53	x x	91.1] x] x	0.63	x	0.7] =] =	98.28	(75)
Northeast 0.9x	0.77] ^] x	3.53	^ x	91.1 72.63] ^] _x	0.63	X	0.7]	98.28 78.35	(75)
Northeast 0.9x] ^] x		^ x] ^] _x		X] =] =		(75)
Northeast 0.9x	0.77] ^] x	3.53	^ x	72.63 50.42] ^] x	0.63	X	0.7]	78.35 54.39	(75)
Northeast 0.9x	0.77] ^] x	3.53	l ^ l x	50.42] ^] _x	0.63	X	0.7]	54.39	(75)
Northeast 0.9x	0.77] ^] x	3.53	^ x	28.07] ^] x	0.63	X	0.7] -] =	30.28	(75)
Northeast 0.9x	0.77] ^] x	3.53	l ^ l x	28.07] ^] x	0.63	X	0.7]	30.28	(75)
Northeast 0.9x	0.77] ^] x	3.53	x	14.2] ^] _x	0.63	x	0.7] =	15.32	(75)
Northeast 0.9x	0.77] ^] x	3.53	l ^	14.2] ^] x	0.63	x	0.7]	15.32	(75)
Northeast 0.9x	0.77] ^] x	3.53	l ^ l x	9.21] ^] _x	0.63	X	0.7]	9.94	(75)
Northeast 0.9x	0.77] ^] x	3.53	^ x	9.21] ^] x	0.63	X	0.7]	9.94	(75)
Southwest _{0.9x}	0.77] ^] x	3.24	^ x	36.79] ^]	0.63	X	0.7] -] =	36.43	(79)
Southwest _{0.9x}	0.77] ^] x	3.47	^ x	36.79]]	0.63	X	0.7]	39.02	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	^ x	36.79]]	0.63	X	0.7] -] =	36.43	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	^ x	36.79]]	0.63	X	0.7]	36.43	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	^ x	62.67]]		X	0.7]	62.06	(79)
Southwest _{0.9x}] ^] x		^ x]]	0.63	X] -] =		(79)
Southwest _{0.9x}	0.77] ^] x	3.47	^ x	62.67	<u> </u> 	0.63	X	0.7]	66.46	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	^ x	62.67]]	0.63	X	0.7]	62.06	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	^ x	85.75]]	0.63	X	0.7] -] =	84.91	(79)
Southwest _{0.9x}	0.77] ^] x	3.47	l ^ l x	85.75	<u> </u> 	0.63	X	0.7]	90.94	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	l ^	85.75]]	0.63	x	0.7] =	84.91	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	l ^	85.75]]	0.63	X	0.7]	84.91	(79)
Southwest _{0.9x}	0.77] ^] x	3.24	l ^ l x	106.25]]	0.63	X	0.7] =	105.21	(79)
Southwest _{0.9x}	0.77]	3.47	X	106.25]]	0.63	X	0.7]] =	112.68	(79)
Southwest _{0.9x}	0.77] x	3.24	x	106.25]]	0.63	x	0.7]] =	105.21	(79)
Southwest _{0.9x}	0.77] x	3.24	x	106.25]]	0.63	x	0.7]] =	105.21	(79)
Southwest _{0.9x}	0.77]]	3.24	x	119.01]]	0.63	X	0.7] =	117.84	(79)
Southwest _{0.9x}	0.77]] x	3.47	x	119.01]]	0.63	X	0.7] =	126.21	(79)
Southwest _{0.9x}	0.77] x	3.24	X	119.01]]	0.63	X	0.7] =	117.84	(79)
Southwest _{0.9x}	0.77	X	3.24	X	119.01	<u> </u> 	0.63	X	0.7] =	117.84	(79)
Southwest _{0.9x}	0.77	X	3.24	X	118.15	<u> </u> 	0.63	X	0.7] =	116.99	(79)
Southwest _{0.9x}	0.77) x	3.47	X	118.15	<u> </u> 	0.63	X	0.7] =	125.3	(79)
Southwest _{0.9x}	0.77	x	3.24	×	118.15	, 	0.63	x	0.7] =	116.99	(79)
Southwest _{0.9x}	0.77	X	3.24	×	118.15	, 	0.63	x	0.7] =	116.99	(79)
Southwest _{0.9x}	0.77	X	3.24	×	113.91	ĺ	0.63	x	0.7] =	112.79	(79)
Southwest _{0.9x}	0.77	X	3.47	x	113.91	j	0.63	x	0.7] =	120.8	(79)
Southwest _{0.9x}	0.77	X	3.24	x	113.91	<u> </u>	0.63	x	0.7] =	112.79	(79)
L		J		ı				ı		1		

		,						ı		1		_
Southwest _{0.9x}	0.77	X	3.24	X	113.91		0.63	X	0.7] =	112.79	(79)
Southwest _{0.9x}	0.77	X	3.24	X	104.39		0.63	X	0.7	=	103.37	(79)
Southwest _{0.9x}	0.77	X	3.47	X	104.39		0.63	X	0.7	=	110.7	(79)
Southwest _{0.9x}	0.77	X	3.24	X	104.39		0.63	х	0.7	=	103.37	(79)
Southwest _{0.9x}	0.77	X	3.24	X	104.39		0.63	X	0.7	=	103.37	(79)
Southwest _{0.9x}	0.77	X	3.24	X	92.85]	0.63	X	0.7] =	91.94	(79)
Southwest _{0.9x}	0.77	X	3.47	X	92.85]	0.63	X	0.7	=	98.47	(79)
Southwest _{0.9x}	0.77	X	3.24	x	92.85		0.63	X	0.7	=	91.94	(79)
Southwest _{0.9x}	0.77	X	3.24	x	92.85		0.63	X	0.7	=	91.94	(79)
Southwest _{0.9x}	0.77	X	3.24	x	69.27]	0.63	X	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	3.47	x	69.27]	0.63	x	0.7	=	73.46	(79)
Southwest _{0.9x}	0.77	X	3.24	x	69.27]	0.63	x	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	3.24	x	69.27]	0.63	X	0.7	=	68.59	(79)
Southwest _{0.9x}	0.77	X	3.24	x	44.07]	0.63	x	0.7	=	43.64	(79)
Southwest _{0.9x}	0.77	X	3.47	x	44.07		0.63	x	0.7	=	46.74	(79)
Southwest _{0.9x}	0.77	X	3.24	x	44.07		0.63	X	0.7	=	43.64	(79)
Southwest _{0.9x}	0.77	X	3.24	x	44.07		0.63	X	0.7	=	43.64	(79)
Southwest _{0.9x}	0.77	X	3.24	x	31.49		0.63	X	0.7	=	31.18	(79)
Southwest _{0.9x}	0.77	X	3.47	x	31.49		0.63	x	0.7	=	33.39	(79)
Southwest _{0.9x}	0.77	X	3.24	x	31.49		0.63	X	0.7	=	31.18	(79)
Southwest _{0.9x}	0.77	X	3.24	x	31.49		0.63	X	0.7	=	31.18	(79)
Northwest 0.9x	0.77	X	0.93	x	11.28	x	0.63	x	0.7	=	3.21	(81)
Northwest 0.9x	0.77	X	0.93	x	22.97	x	0.63	x	0.7	=	6.53	(81)
Northwest 0.9x	0.77	X	0.93	x	41.38	X	0.63	X	0.7	=	11.76	(81)
Northwest 0.9x	0.77	X	0.93	x	67.96	x	0.63	x	0.7	=	19.31	(81)
Northwest 0.9x	0.77	x	0.93	x	91.35	x	0.63	x	0.7	=	25.96	(81)
Northwest 0.9x	0.77	X	0.93	x	97.38	X	0.63	X	0.7	=	27.68	(81)
Northwest 0.9x	0.77	X	0.93	x	91.1	X	0.63	X	0.7	=	25.89	(81)
Northwest 0.9x	0.77	X	0.93	x	72.63	X	0.63	X	0.7	=	20.64	(81)
Northwest 0.9x	0.77	X	0.93	x	50.42	X	0.63	X	0.7	=	14.33	(81)
Northwest 0.9x	0.77	X	0.93	x	28.07	x	0.63	x	0.7	=	7.98	(81)
Northwest 0.9x	0.77	x	0.93	x	14.2	x	0.63	x	0.7	=	4.04	(81)
Northwest 0.9x	0.77	X	0.93	x	9.21	x	0.63	x	0.7	=	2.62	(81)
Rooflights 0.9x	1	X	2.25	x	26	x	0.63	x	0.7	=	23.19	(82)
Rooflights 0.9x	1	x	0.75	x	26	x	0.63	x	0.7	=	7.78	(82)
Rooflights 0.9x	1	x	0.65	×	26	x	0.63	x	0.7] =	6.74	(82)
Rooflights 0.9x	1	x	2.25	x	54	x	0.63	x	0.7] =	48.17	(82)
Rooflights 0.9x	1	x	0.75	x	54	x	0.63	x	0.7] =	16.15	(82)
Rooflights 0.9x	1	x	0.65	x	54	x	0.63	x	0.7	=	14.01	(82)
Rooflights 0.9x	1	x	2.25	x	96	x	0.63	x	0.7] =	85.63	(82)
Rooflights _{0.9x}	1	x	0.75	x	96	x	0.63	x	0.7] =	28.71	(82)
_		-		-		- '		•		-		_

Rooflights	s o ov		–			"Г			1	0.00		"г		_	Г	24.0	7(00)
Rooflights	<u> </u>	1	x	0.6		х [Г		96] X]	0.63		х [0.7	=	= [24.9	(82)
		1	×	2.2		X		150	X	0.63	_	X	0.7	=	= [133.8	(82)
Rooflights		1	×	0.7		X		150] X]	0.63		X	0.7	=	= [44.87	(82)
Rooflights		1	×	0.6		X		150	X	0.63		X	0.7		= [38.91	(82)
Rooflights		1	X	2.2	5	X		192	X	0.63		X	0.7	_	= [171.27	(82)
Rooflights	<u> </u>	1	X	0.7	5	x [192	X	0.63		x L	0.7		= [57.43	(82)
Rooflights	<u> </u>	1	X	0.6	5	x		192	X	0.63		X	0.7		= [49.81	(82)
Rooflights		1	Х	2.2	5	x		200	X	0.63		x	0.7	:	= [178.41	(82)
Rooflights	S 0.9x	1	X	0.7	5	x	2	200	X	0.63		X	0.7		= [59.82	(82)
Rooflights	3 0.9x	1	X	0.6	5	X	2	200	X	0.63		X	0.7		= [51.88	(82)
Rooflights	S 0.9x	1	Х	2.2	5	x	•	189	X	0.63		x	0.7	:	= [168.59	(82)
Rooflights	S 0.9x	1	X	0.7	5	x		189	X	0.63		x	0.7		= [56.53	(82)
Rooflights	3 0.9x	1	X	0.6	5	x [,	189	x	0.63		x	0.7		= [49.03	(82)
Rooflights	S 0.9x	1	Х	2.2	5	x		157	X	0.63		x	0.7	:	= [140.05	(82)
Rooflights	S 0.9x	1	Х	0.7	5	x		157	X	0.63		x	0.7	:	= [46.96	(82)
Rooflights	S 0.9x	1	х	0.6	5	x	•	157	x	0.63		x	0.7		= [40.73	(82)
Rooflights	S 0.9x	1	x	2.2	5	x	,	115	x	0.63		x [0.7		= [102.58	(82)
Rooflights	3 0.9x	1	x	0.7	5	x	,	115	x	0.63		x	0.7		= [34.4	(82)
Rooflights	S 0.9x	1	x	0.6	5	x		115	x	0.63		x	0.7		= [29.83	(82)
Rooflights	S 0.9x	1	x	2.2	5	x [66	x	0.63		x [0.7		= [58.87	(82)
Rooflights	3 0.9x	1	x	0.7	5	x		66	x	0.63		x	0.7		= [19.74	(82)
Rooflights	S 0.9x	1	x	0.6	5	x [66	X	0.63		x [0.7	=	_ [17.12	(82)
Rooflights	S 0.9x	1	x	2.2	5	x [33	X	0.63		x [0.7		<u> </u>	29.44	(82)
Rooflights	S 0.9x	1	×	0.7		x [33) x	0.63		x [0.7	_	<u> </u>	9.87	(82)
Rooflights	3 0.9x	1	×	0.6		x [33)]	0.63		x [0.7	=	_ [8.56	(82)
Rooflights	<u> </u>	1	×	2.2		x [21]]	0.63		x [0.7	=	_ [18.73	(82)
Rooflights		1	X	0.7		x [21]] x	0.63		x [0.7		_	6.28	(82)
Rooflights	<u> </u>	<u>·</u> 1	×	0.6	==	x [21] x	0.63		x [0.7	=	_	5.45	(82)
	- 0.0X	'	^	0.0	<u> </u>	^ L		<u> </u>] ^	0.03		^ L	0.7		_ [0.40	(02)
Solar gai	ins in wa	atts, calc	culated	for each	n month	1			(83)m	n = Sum(74))m(8	2)m					
—			85.96	811.82	981.29	$\overline{}$	04.17	955.78	825			13.49	260.18	179.8	89		(83)
Total gai	ins – inte	ernal and	d solar	(84)m =	: (73)m	+ (8	33)m ,	watts	!		-				_		
(84)m= 7	705.48 8	76.73 1	059.73	1259.73	1402.59	140	00.06	1335.29	1211	1.83 1063.	.57 86	8.94	715.66	658.2	21		(84)
7. Mear	n interna	l temper	rature ((heating	seasor)				,	•			•			
		· ·					area f	rom Tal	ole 9.	, Th1 (°C))				Г	21	(85)
Utilisatio		•	•			_				, (- ,	,				L		
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug Se	a de	Oct	Nov	De	С		
(86)m=	-	_	0.98	0.92	0.78	+).59	0.44	0.			0.96	0.99	1			(86)
			!			<u> </u>							1	L			
iviean in			20.18	20.58	20.85	_	w ste 0.97	20.99	20.	able 9c)	<u>, </u>	20.5	19.99	19.6			(87)
(87)m=	19 64				_U.UU	. ~\	J.J/	20.00		JU 20.8	- I -	-0.0	10.00	I 19.0	. 1		(0.)
` '			!	!									•				
Temper	rature du	uring hea	!	!		dw	elling 9.89	from Ta	able 9	9, Th2 (°C		9.88	19.88	19.87	 		(88)

Litilicat	tion foo	tor for a	aine for	roct of d	volling l	n2 m (sc	o Tabla	00)						
(89)m=	1	0.99	0.97	rest of d	0.72	0.5	0.33	9a) 0.39	0.68	0.94	0.99	1		(89)
` ′			<u> </u>	<u>!</u>			<u> </u>		<u> </u>		0.99	'		(00)
Mean I	18.06	temper	18.85	the rest	of dwelli	ng 12 (fo	ollow ste	ps 3 to 1	/ in Tabl	e 9c)	18.59	18.01		(90)
(90)m=	16.06	10.37	10.00	19.4	19.75	19.67	19.69	19.69	!	LA = Livin	!	ļ	0.22	(90)
										L/(- L/VIII	g aroa . (-	,, –	0.33	(91)
	T		· `	r the wh			i e	<u> </u>				ı 1		
(92)m=	18.57	18.85	19.28	19.79	20.11	20.23	20.25	20.25	20.17	19.71	19.04	18.53		(92)
· · · · · -				internal			i			<u> </u>				(00)
(93)m=	18.57	18.85	19.28	19.79	20.11	20.23	20.25	20.25	20.17	19.71	19.04	18.53		(93)
		·	uirement				44 6	T	41	. 	70)			
				mperatur using Ta		ed at ste	ep 11 of	Table 9i	o, so tha	t II,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	1					T					
(94)m=	0.99	0.99	0.96	0.89	0.73	0.53	0.37	0.42	0.71	0.94	0.99	1		(94)
				4)m x (84				ı	1	ı	ı	- 1		(0.5)
` ′	701.71	864.49	<u> </u>	1115.92		740.93	490.3	513.53	751.18	813.24	707.27	655.61		(95)
				perature			100	40.4		40.0	7.4			(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
_			1770.62	al tempe	1148.3	760.8	493.08	518.86	823.26	1243.9	1638.78	1975.79		(97)
` '	l		l .	or each m								1973.79		(01)
	956.61	721.44	559.7	269.44	88.88	0	0.02	0	0	320.41	670.69	982.22		
(33)				<u> </u>				<u> </u>	l per year	<u> </u>	<u> </u>	L	4569.38	(98)
Space	heating	g require	ement in	kWh/m²	/year				,	(,(-		41.84	` (99)
·	· ·	• •		ividual h	•	/stems i	ncluding	micro-C	;HP)					
	heatin		ito iriu	ividual II	cating sy	y Storris T	nordanig	TITIOTO C	<i>/</i>					
•		_	at from s	econdar	y/supple	mentary	system						0	(201)
Fractio	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fractio	n of tot	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficier	ncy of s	seconda	ry/suppl	ementar	y heating	g system	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ar
Space	heating	g require	ement (c	alculate	d above)		•							
	956.61	721.44	559.7	269.44	88.88	0	0	0	0	320.41	670.69	982.22		
(211)m :	= {[(98))m x (20)4)] } x 1	00 ÷ (20	16)									(211)
1	1023.11	771.59	598.61	288.17	95.06	0	0	0	0	342.68	717.31	1050.5		
_			!				!	Tota	l (kWh/yea	ar) =Sum(2	211),,,,5,10,12	=	4887.04	(211)
Space	heating	g fuel (s	econdar	y), kWh/	month							·		_
-			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	- <u> </u>	0	(215)
												•		

Water heating								
Output from water heater (calculated above) 216.4 190.75 200.35 179.63 176.06 1	57.35 151.15	165.81	165.51	186.27	196.92	211.21]	
Efficiency of water heater				1			79.8	(216)
(217)m= 88.32 88.03 87.41 85.89 83.1	79.8 79.8	79.8	79.8	86.25	87.83	88.4		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•						•	
· /	97.18 189.41	207.79	207.4	215.97	224.21	238.92		
		Tota	I = Sum(2	19a) ₁₁₂ =			2592.81	(219)
Annual totals				k\	Wh/year	•	kWh/year	_ ¬
Space heating fuel used, main system 1							4887.04	_
Water heating fuel used							2592.81	╛
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2300
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							425.75	(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	
Space heating (main system 1)	(211) x			0.2	16	=	1055.6	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	560.05	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1615.65	(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	=	220.96	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1875.54	_ (272)

TER =

(273)

25.31

		User Details:			
Assessor Name: Software Name:	Su Lee Stroma FSAP 2012	Stroma Num Software Ve		RO031315 ersion: 1.0.4.16	
	F	Property Address: Unit 06	ò		
Address :	138-140 Highgate Road, Hi	ghgate, Highgate, NW5	1PB		
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m	3)
Basement		38.62 (1a) x	2.7 (2a)	= 104.27	(3a)
Ground floor		34.58 (1b) x	3.2 (2b)	= 110.66	(3b)
First floor		31.61 (1c) x	4.65 (2c)	= 146.99	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 104.81 (4)			
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+(3n)	= 361.92	(5)
2. Ventilation rate:					
	main seconda heating heating	ry other	total	m³ per hou	ır
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ans		4 x 10 =	40	(7a)
Number of passive vents	3		0 x 10 =	0	(7b)
Number of flueless gas f	ires	Ī	0 x 40 =	0	(7c)
			Ai	r changes per h	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40 ÷ (5) =	= 0.11	(8)
If a pressurisation test has l	peen carried out or is intended, procee	ed to (17), otherwise continue t	rom (9) to (16)		
Number of storeys in t	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0.	1 = 0	(10)
	0.25 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 greater wall area (after			
=	floor, enter 0.2 (unsealed) or (.1 (sealed), else enter 0		0	(12)
If no draught lobby, en	,	(0	(13)
	s and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
	q50, expressed in cubic metro	es per hour per square m	netre of envelope area		(17)
•	lity value, then $(18) = [(17) \div 20] +$			0.36	(18)
·	es if a pressurisation test has been do		is being used	0.00	` ′
Number of sides sheltered	ed			1	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =	0.92	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18) x (20) =		0.33	(21)
Infiltration rate modified	for monthly wind speed				_
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov D	ec	
Monthly average wind sp	peed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>	<u> </u>			
Adjusted infiltra		<u> </u>				` 	`	` ´			0.00		
0.43 Calculate effec	0.42 ctive air	0.41 Change	0.37 rate for t	0.36 he appli	0.32 Cable ca	0.32 S e	0.31	0.33	0.36	0.38	0.39		
If mechanica		-		upp	- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	l – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		<u> </u>	<u> </u>	``	<u> </u>	· ` `	ŕ		<u> </u>				(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(24d)m = 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(24d)
Effective air						<u> </u>	<u> </u>						
(25)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
			•				•		•				
3 Heat Insses	s and he	at Ince i	naramete	or.									
3. Heat losses					Net Ar	ea	U-valı	ue	AXU		k-value	<u> </u>	AXk
3. Heat losses	s and he Gros area	SS	paramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				<) 			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x 1/2	W/m2	eK = 0.04] =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 3.15	m ² x x1/2 x1/2	W/m2 1 /[1/(1.4)+	eK = 0.04] = 0.04] =	2.46 4.18	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.46 3.15 3.25	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.46 4.18 4.31	<) 			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91	m ²	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	2.46 4.18 4.31 1.21	<)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 2.46 4.18 4.31 1.21 4.18	<) 			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.18 4.31 1.21 4.18 4.37	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 3.15	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18				kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type	Gros area 1 2 3 4 5 6 7 e 1	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 3.15	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	2.46 4.18 4.31 1.21 4.18 4.37 4.18	4			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 3.15 3.3	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) +	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134	4			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 3.15 0.73203 0.63486	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134 1.24445	4 7 3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 2.1831 0.73203 0.63486 38.62	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134 1.24445 1.07926 5.0206	4 7 3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin m	gs	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 2.18314 0.73203 0.63486 38.62	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134 1.24445 1.07926 5.0206 1.83	4 7 3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	5 (m²)	Openin m	gs ₁ ²	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 3.15 0.73203 0.63486 38.62 10.15	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134 1.24445 1.07926 5.0206 1.83 4.81	4 7 3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	55 (m²)	Openin m	gs ₁ ²	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 2.1831 0.73203 0.63486 38.62 10.15 26.7 1.93	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134 1.24445 1.07926 5.0206 1.83 4.81 0.35	4 7 3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	55 (m²)	Openin m	gs ₁₂	A ,r 2.46 3.15 3.25 0.91 3.15 3.3 3.15 0.73203 0.63486 38.62 10.15	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	K	(W/I 2.46 4.18 4.31 1.21 4.18 4.37 4.18 4.37 3.71134 1.24445 1.07926 5.0206 1.83 4.81	4 7 3			kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 6.02	3.3	2.72	X	0.18	=	0.49				(29)
Walls Type7 0.8	0	0.8	х	0.18	=	0.14				(29)
Walls Type8 0.96	0	0.96	х	0.18	=	0.17				(29)
Walls Type9 5.28	0	5.28	x	0.18		0.95				(29)
Walls Type10 5	0	5	x	0.18	=	0.9				(29)
Walls Type11 5.76	3.15	2.61	x	0.18	=	0.47				(29)
Walls Type12 0.42	0	0.42	x	0.18	_ =	0.08			\neg	(29)
Walls Type13 6.18	0	6.18	x	0.18		1.11				(29)
Walls Type14 8.74	3.3	5.44	x	0.18		0.98				(29)
Walls Type15 1.86	0	1.86	x	0.18		0.33	T i		7 <u> </u>	(29)
Walls Type16 8.6	2.46	6.14	x	0.18		1.11	T i		7 <u> </u>	(29)
Walls Type17 40	0	40	x	0.18		7.2	T i		7 <u> </u>	(29)
Walls Type18 8.97	0	8.97	×	0.18	=	1.61	Ħ i		7 H	(29)
Walls Type19 0.6	0	0.6	x	0.18		0.11	T i		7 <u> </u>	(29)
Walls Type20 8.37	3.15	5.22	x	0.18		0.94	T i		7 <u> </u>	(29)
Roof Type1 31.14	2.92	28.22	x	0.13		3.67	T i		7 <u> </u>	(30)
Roof Type2 2.38	0.63	1.75	×	0.13	_ =	0.23	T i		7 <u> </u>	(30)
Total area of elements, m ²		228.89	=							(31)
Party wall		29.19	x	0	=	0	\neg			(32)
Party wall		32.58	x	0		0	T i		7 <u> </u>	(32)
Party wall		38.73	x	0		0	T i		<u> </u>	(32)
* for windows and roof windows, use e ** include the areas on both sides of in			ted using	formula 1	[(1/U-valu	ue)+0.04] a	s given in	paragraph	n 3.2	_
Fabric heat loss, W/K = S (A x	U)			(26)(30)	+ (32) =				67.96	(33)
Heat capacity Cm = S(A x k)					((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass parameter (TMF	o = Cm ÷ TFA) i	n kJ/m²K			Indica	ative Value:	Medium		250	(35)
For design assessments where the decan be used instead of a detailed calcu		tion are not l	known pr	ecisely the	indicative	e values of	TMP in T	able 1f		_
Thermal bridges : S (L x Y) cale	culated using Ap	ppendix K							9.07	(36)
if details of thermal bridging are not kn	own(36) = 0.15 x(3)	31)								_
Total fabric heat loss						- (36) =	, ,_		77.03	(37)
Ventilation heat loss calculated	i	1 1				i = 0.33 × (<u> </u>	1	
(38)m= 70.51 70.09 69.68	Apr May 67.75 67.39	Jun 65.71	Jul 65.71	Aug 65.4	Sep 66.36	Oct 67.39	Nov 68.12	Dec 68.89	ł	(38)
` '	01.10	00.71	55.71	00.4		<u> </u>		1 00.03	J	(30)
Heat transfer coefficient, W/K (39)m= 147.54 147.12 146.71	144.78 144.42	142.74	142.74	142.43	143.39	1 = (37) + (37)	145.15	145.91	1	
(00)/11= 177.07 147.12 140.71	1-77.70 174.42	172.14	174.14	172.40		Average =			144.78	(39)
Heat loss parameter (HLP), W/	m²K	, ,				i = (39)m ÷			1	

Mar

31

Apr

Number of days in month (Table 1a)

Feb

28

Jan

31

1.38

May

31

1.36

Jun

30

1.36

Jul

31

1.36

Aug

31

1.37

Sep

30

(40)m=

(41)m =

(40)

(41)

1.38

1.39

Dec

31

Average = $Sum(40)_{1...12}/12=$

Nov

30

Oct

31

4. Water heating	nergy requ	uiremen <u>t:</u>								kWh/ye	ear:	
Assumed occupan									2	.78		(42)
if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76	x [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13				. ,
Annual average ho								se target d		0.22		(43)
not more that 125 litres	-			_	_	io domovo	a water at	oo targot o	•			
	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litre	` 					· <i>'</i>		1,00,00	1,00,00			
(44)m= 110.24 106	23 102.23	98.22	94.21	90.2	90.2	94.21	98.22	102.23 Total = Su	106.23 m(44) ₁₁₂ =	110.24	1202.65	(44)
Energy content of hot w	ater used - ca	lculated m	onthly $= 4$.	190 x Vd,ı	m x nm x [OTm / 3600					1202.00	
(45)m= 163.49 142	99 147.55	128.64	123.43	106.51	98.7	113.26	114.61	133.57	145.8	158.33		_
If instantaneous water I	eating at poir	nt of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1576.86	(45)
(46)m= 24.52 21.	15 22.13	19.3	18.51	15.98	14.8	16.99	17.19	20.04	21.87	23.75		(46)
Water storage loss				//// IDC								
Storage volume (lit If community heating	,				Ū		ame ves	sei		150		(47)
Otherwise if no sto	_		-				ers) ente	er '0' in ((47)			
Water storage loss									,			
a) If manufacturer			or is kno	wn (kWl	n/day):				1	.7		(48)
Temperature facto									0.	.54		(49)
Energy lost from w b) If manufacturer	_	-		or is not		(48) x (49)) =		0.	.92		(50)
Hot water storage		-								0		(51)
If community heating	•	ion 4.3										
Volume factor from Temperature factor		2h								0		(52)
Energy lost from w			oor			(47) x (51)) v (52) v (53) -		0		(53)
Enter (50) or (54)	•	z, KVVII/y	cai			(41) X (31))	55) =		0 .92		(54) (55)
Water storage loss	` ,	for each	month			((56)m = ((55) × (41)	m				, ,
(56)m= 28.48 25.	73 28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(56)
If cylinder contains ded	cated solar st	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 28.48 25.	73 28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48		(57)
Primary circuit loss	(annual) fr	om Table	e 3	-	-	-	-	-		0		(58)
Primary circuit loss			,		. ,	, ,						
(modified by fact						·		1	- 			(50)
(59)m= 23.26 21.	!	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calcula		1	ì ´	` 	- ` 	Í		<u> </u>	<u> </u>			(64)
(61)m= 0 (0	0	0	0	0	0	0	0	0	(50)	(61)
Total heat required (62)m= 215.23 189		178.71	alculated	for eac	h month 150.44	(62)m =	0.85 × 164.69	` 	` 	`	(59)m + (61)m	(62)
		ı	l					185.31	195.88	210.07		(02)
Solar DHW input calcul (add additional line								ı contribut	ion to wate	er neating)		
(63)m= 0 (1	0	0	0	0	0	0	0	0	0		(63)
		(SAD 0.02)	· · · · · · · · · · · · · · · · · · ·	<u> </u>	<u> </u>	I	<u> </u>	I	I	1	Page 4	of 10

Support From Nature Interester Support From Nature Support F	Output frame water haster							
Couput from water heater (annual), Couput from water heater (annual),	Output from water heater	170 71 175 10	156 50 150 44	165 164.60	105 21 105 00	210.07		
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 (65)m 96.76 84.93 90.46 82.83 82.44 75.48 74.21 79.06 78.17 85.81 88.54 94.04 (65)m include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Intornal gains (see Table 5), Wats Metabolic gains (Table 5), Wats Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m 138.99 138	(04)111= 213.23 109.73 199.3	176.71 175.16	150.59 150.44			<u> </u>	2186 13	(64)
(65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Intornal gains (see Table 5 and 5a). Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Heat gains from water heating	kWh/month 0.25	′[0.85 v (45)m			!		(0.)
include (67)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating Secondary	 	 	<u> </u>	,	' ' '	, J	(65)	
Metabolic gains (Table 5), Wats Jun Jul Aug Sep Oct Nov Dec (66)m 138.99	` '					ļ	oating	(00)
Metabolic qains (Table 5), Watts	, ,	` , ,	illider is ill tile d	iweiling of flot v	vater is from com	iniumity i	eating	
Separation Sep		,						
(66)me			Jun Jul	Aug Sep	Oct Nov	Dec		
Lighting gains (Calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 23.52	 	+			+ + +			(66)
(67)me	` '	+ + +						
(68)m= 263.88 266.62 259.72 245.03 226.48 209.05 197.41 194.67 201.57 216.26 234.81 252.23 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 36.9 36.9 36.9 36.9 36.9 36.9 36.9 36.9		'' 			19.43 22.68	24.18		(67)
(68)m= 263.88 266.62 259.72 245.03 226.48 209.05 197.41 194.67 201.57 216.26 234.81 252.23 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 36.9 36.9 36.9 36.9 36.9 36.9 36.9 36.9	Appliances gains (calculated i	n Appendix L, equ	ation L13 or L13	3a), also see Ta	able 5	<u> </u>		
Color Colo	· · · · · · · · · · · · · · · · · · ·	, '' , ''		<u> </u>	1 1	252.23		(68)
Color Colo	Cooking gains (calculated in /	Appendix L, equation	on L15 or L15a),	, also see Table	e 5			
Columbia Columbia		 			1 1	36.9		(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -111.19 -11	Pumps and fans gains (Table	5a)	, ,	ļ.				
(71)ms -111.19 -1	(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)
Water heating gains (Table 5) (72)m= 128.71 126.39 121.58 115.05 110.8 104.83 99.75 106.26 108.57 115.33 122.97 126.4 (72) Total internal gains =	Losses e.g. evaporation (nega	ative values) (Table	e 5)		•			
Total internal gains =	(71)m= -111.19 -111.19 -111.19	-111.19 -111.19	-111.19 -111.19	-111.19 -111.19	-111.19 -111.19	-111.19		(71)
Total internal gains =	Water heating gains (Table 5)		•	•	•			
(73)m= 483.8 481.6 465.99 440.63 414.6 389.7 373.63 380.03 393.14 418.73 448.16 470.51 (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 Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75)	(72)m= 128.71 126.39 121.58	115.05 110.8	104.83 99.75	106.26 108.57	115.33 122.97	126.4		(72)
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d	Total internal gains =		(66)m + (67)m	+ (68)m + (69)m +	(70)m + (71)m + (72))m		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area m² Flux Table 6a g_ Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Nor	(73)m= 483.8 481.6 465.99	440.63 414.6	389.7 373.63	380.03 393.14	418.73 448.16	470.51		(73)
Orientation: Access Factor Table 6d Area m² Flux Table 6a g_ Table 6b FF Table 6c Gains (W) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 92.12 (75) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
Table 6d m² Table 6a Table 6b Table 6c (W) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 11.28 x 0.63 x 0.7 = 11.38 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 22.97 x 0.63 x 0.7 = 23.16 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 41.38 x 0.63 x 0.7 = 41.73 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 67.96 x 0.63 x 0.7 = 68.54 (75) Northeast 0.9x 0.77 x 3.3 x 91.35 x 0.63 x 0.7 = 68.54 (75)						tion.		
Northeast 0.9x				g_ Table 6b				
Northeast 0.9x	N 4					—] _		7(75)
Northeast 0.9x	N. 11 1					=		=
Northeast 0.9x	N 41 4					=		=
Northeast 0.9x	North				╡	=		=
Northeast 0.9x	N 41 4					=		╡
Northeast 0.9x	N 41 4					_		=
Northeast 0.9x	North					=		╡
Northeast 0.9x	N 41 4	 				=		=
	Northeast					=		=
	Northeast					=		=
Northeast 0.9x 0.77 x 3.3 x 97.38 x 0.63 x 0.7 = 98.21 (75)					= ===	=		=

Northeast 0.9x

Northeast _{0.9x}	0.77) x	2.2	l x	01.1] _x	0.63	X	0.7	1 =	01.00	(75)
Northeast 0.9x	0.77	J 1	3.3]]	91.1]]	0.63	! !] 1	91.88	(75)
Northeast 0.9x	0.77] x] ,		l x l v	91.1	X	0.63	X	0.7] = 1 _	91.88	(75)
Northeast 0.9x	0.77] x] x	3.3	x x	72.63 72.63] x] x	0.63	X	0.7] =] =	73.25 73.25	(75)
Northeast 0.9x	0.77] ^] x	3.3] ^] _x	50.42] ^] _x	0.63	^ x	0.7]	50.85	(75)
Northeast 0.9x	0.77] ^] x	3.3] ^] x	50.42] ^] x	0.63	^ x	0.7] -] =	50.85	(75)
Northeast 0.9x	0.77] ^] x	3.3] ^] x	28.07] ^] x	0.63	^ x	0.7]	28.31	(75)
Northeast 0.9x	0.77] ^] x	3.3] ^] x	28.07] ^] _x	0.63	x	0.7]	28.31	(75)
Northeast 0.9x	0.77] ^] x	3.3] ^] _x	14.2] ^] x	0.63	^ x	0.7] -] =	14.32	(75)
Northeast 0.9x	0.77]	3.3] ^] x	14.2] ^] x	0.63	X	0.7] =	14.32	(75)
Northeast 0.9x	0.77]	3.3	l ^ l x	9.21] ^] _x	0.63	×	0.7] =	9.29	(75)
Northeast _{0.9x}	0.77]	3.3] ^] x	9.21] ^] _x	0.63	x	0.7] =	9.29	(75)
Southwest _{0.9x}	0.77] x	3.15] ^] _x	36.79] ^]	0.63	X	0.7]] =	35.42	(79)
Southwest _{0.9x}	0.77] x	3.25] ^] _X	36.79]]	0.63	x	0.7]]	36.55	(79)
Southwest _{0.9x}	0.77] x	3.15] x	36.79]]	0.63	X	0.7]] =	35.42	(79)
Southwest _{0.9x}	0.77]]	3.15] x	36.79]]	0.63	X	0.7]] _	35.42	(79)
Southwest _{0.9x}	0.77]] x	3.15	l X	62.67]]	0.63	X	0.7]] _	60.33	(79)
Southwest _{0.9x}	0.77]]	3.25]]	62.67]]	0.63	X	0.7]]	62.25	(79)
Southwest _{0.9x}	0.77]]	3.15) x	62.67]]	0.63	X	0.7]] _	60.33	(79)
Southwest _{0.9x}	0.77	X	3.15	l X	62.67	<u> </u> 	0.63	X	0.7] =	60.33	(79)
Southwest _{0.9x}	0.77	X	3.15) x	85.75	<u> </u> 	0.63	X	0.7] =	82.55	(79)
Southwest _{0.9x}	0.77) x	3.25	X	85.75	i	0.63	X	0.7] =	85.17	(79)
Southwest _{0.9x}	0.77	X	3.15	x	85.75	j	0.63	X	0.7	j =	82.55	(79)
Southwest _{0.9x}	0.77	X	3.15	x	85.75	j	0.63	х	0.7	j =	82.55	(79)
Southwest _{0.9x}	0.77	X	3.15	x	106.25	j	0.63	x	0.7] =	102.29	(79)
Southwest _{0.9x}	0.77	X	3.25	×	106.25	ĺ	0.63	х	0.7	j =	105.53	(79)
Southwest _{0.9x}	0.77	x	3.15	x	106.25	j	0.63	x	0.7	=	102.29	(79)
Southwest _{0.9x}	0.77	x	3.15	x	106.25	j	0.63	x	0.7] =	102.29	(79)
Southwest _{0.9x}	0.77	x	3.15	x	119.01	ĺ	0.63	x	0.7	=	114.57	(79)
Southwest _{0.9x}	0.77	X	3.25	x	119.01]	0.63	x	0.7	<u> </u>	118.21	(79)
Southwest _{0.9x}	0.77	x	3.15	x	119.01	Ī	0.63	х	0.7] =	114.57	(79)
Southwest _{0.9x}	0.77	X	3.15	x	119.01]	0.63	x	0.7	<u> </u>	114.57	(79)
Southwest _{0.9x}	0.77	X	3.15	x	118.15]	0.63	x	0.7	=	113.74	(79)
Southwest _{0.9x}	0.77	x	3.25	x	118.15]	0.63	x	0.7	<u> </u>	117.35	(79)
Southwest _{0.9x}	0.77	X	3.15	x	118.15]	0.63	X	0.7	=	113.74	(79)
Southwest _{0.9x}	0.77	X	3.15	x	118.15]	0.63	x	0.7] =	113.74	(79)
Southwest _{0.9x}	0.77	x	3.15	x	113.91]	0.63	x	0.7	=	109.66	(79)
Southwest _{0.9x}	0.77	X	3.25	x	113.91]	0.63	x	0.7	=	113.14	(79)
Southwest _{0.9x}	0.77	X	3.15	x	113.91]	0.63	x	0.7	=	109.66	(79)
Southwest _{0.9x}	0.77	X	3.15	x	113.91]	0.63	x	0.7] =	109.66	(79)
Southwest _{0.9x}	0.77	X	3.15	x	104.39]	0.63	x	0.7	=	100.49	(79)

Cauthurata - [1		1		1 1		1		1		٦
Southwest _{0.9x}	0.77	X	3.25	X	104.39		0.63	X	0.7	=	103.68	(79)
Southwest _{0.9x}	0.77	Х	3.15	Х	104.39		0.63	X	0.7	=	100.49	(79)
Southwest _{0.9x}	0.77	X	3.15	X	104.39		0.63	X	0.7	=	100.49	(79)
Southwest _{0.9x}	0.77	X	3.15	Х	92.85		0.63	X	0.7	=	89.39	(79)
Southwest _{0.9x}	0.77	X	3.25	X	92.85		0.63	X	0.7	=	92.22	(79)
Southwest _{0.9x}	0.77	X	3.15	X	92.85		0.63	X	0.7] =	89.39	(79)
Southwest _{0.9x}	0.77	X	3.15	X	92.85		0.63	X	0.7	=	89.39	(79)
Southwest _{0.9x}	0.77	X	3.15	X	69.27		0.63	X	0.7	=	66.68	(79)
Southwest _{0.9x}	0.77	Х	3.25	X	69.27		0.63	X	0.7	=	68.8	(79)
Southwest _{0.9x}	0.77	X	3.15	X	69.27		0.63	X	0.7	=	66.68	(79)
Southwest _{0.9x}	0.77	X	3.15	X	69.27		0.63	X	0.7	=	66.68	(79)
Southwest _{0.9x}	0.77	X	3.15	X	44.07		0.63	X	0.7	=	42.43	(79)
Southwest _{0.9x}	0.77	X	3.25	X	44.07		0.63	X	0.7	=	43.77	(79)
Southwest _{0.9x}	0.77	X	3.15	X	44.07		0.63	X	0.7	=	42.43	(79)
Southwest _{0.9x}	0.77	X	3.15	X	44.07		0.63	X	0.7	=	42.43	(79)
Southwest _{0.9x}	0.77	X	3.15	x	31.49		0.63	x	0.7	=	30.31	(79)
Southwest _{0.9x}	0.77	X	3.25	X	31.49		0.63	X	0.7	=	31.28	(79)
Southwest _{0.9x}	0.77	X	3.15	X	31.49		0.63	X	0.7	=	30.31	(79)
Southwest _{0.9x}	0.77	X	3.15	x	31.49		0.63	x	0.7	=	30.31	(79)
Northwest 0.9x	0.77	x	0.91	x	11.28	X	0.63	x	0.7	=	3.14	(81)
Northwest 0.9x	0.77	X	0.91	x	22.97	x	0.63	x	0.7	=	6.39	(81)
Northwest 0.9x	0.77	х	0.91	х	41.38	X	0.63	X	0.7	=	11.51	(81)
Northwest 0.9x	0.77	X	0.91	X	67.96	X	0.63	X	0.7	=	18.9	(81)
Northwest 0.9x	0.77	х	0.91	х	91.35	X	0.63	X	0.7	=	25.4	(81)
Northwest _{0.9x}	0.77	x	0.91	x	97.38	x	0.63	x	0.7] =	27.08	(81)
Northwest _{0.9x}	0.77	x	0.91	x	91.1	x	0.63	x	0.7] =	25.34	(81)
Northwest 0.9x	0.77	х	0.91	х	72.63	X	0.63	X	0.7	=	20.2	(81)
Northwest _{0.9x}	0.77	x	0.91	x	50.42	x	0.63	x	0.7] =	14.02	(81)
Northwest 0.9x	0.77	x	0.91	x	28.07	x	0.63	x	0.7] =	7.81	(81)
Northwest 0.9x	0.77	x	0.91	х	14.2	X	0.63	X	0.7	=	3.95	(81)
Northwest _{0.9x}	0.77	x	0.91	x	9.21	x	0.63	x	0.7] =	2.56	(81)
Rooflights 0.9x	1	x	2.18	x	26	x	0.63	x	0.7] =	22.53	(82)
Rooflights 0.9x	1	х	0.73	х	26	x	0.63	x	0.7] =	7.55	(82)
Rooflights 0.9x	1	x	0.63	x	26	x	0.63	x	0.7] =	6.55	(82)
Rooflights 0.9x	1	х	2.18	x	54	X	0.63	x	0.7	=	46.79	(82)
Rooflights 0.9x	1	x	0.73	x	54	x	0.63	x	0.7	j =	15.69	(82)
Rooflights 0.9x	1	x	0.63	x	54	x	0.63	x	0.7] =	13.61	(82)
Rooflights 0.9x	1	x	2.18	x	96	x	0.63	x	0.7	j =	83.18	(82)
Rooflights 0.9x	1	x	0.73	x	96	x	0.63	x	0.7	j =	27.89	(82)
Rooflights 0.9x	1	x	0.63	x	96	x	0.63	x	0.7	j =	24.19	(82)
Rooflights 0.9x	1	x	2.18	x	150	x	0.63	x	0.7	j =	129.97	(82)
_		•		•				•		•		_

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Rooflights _{0.9x}	1	X	0.7	3	X	1:	50	X	0.	63	X		0.7		=	43.58	(82)
Rooflights 0.9x	1	X	0.6	3	X	1:	50	X	0.	63	X		0.7		=	37.8	(82)
Rooflights 0.9x	1	X	2.1	8	X	1	92	X	0.	63	X		0.7		=	166.37	(82)
Rooflights 0.9x	1	X	0.7	3	X	1:	92	X	0.	63	X		0.7		=	55.78	(82)
Rooflights _{0.9x}	1	X	0.6	3	X	1:	92	X	0.	63	X		0.7		=	48.38	(82)
Rooflights _{0.9x}	1	X	2.1	8	X	2	00	X	0.	63	X		0.7		=	173.3	(82)
Rooflights 0.9x	1	X	0.7	3	X	2	00	x	0.	63	X		0.7		=	58.11	(82)
Rooflights 0.9x	1	X	0.6	3	X	2	00	X	0.	63	X		0.7		=	50.4	(82)
Rooflights 0.9x	1	X	2.1	8	X	1	89	X	0.	63	X		0.7		=	163.77	(82)
Rooflights 0.9x	1	X	0.7	3	X	1	89	x	0.	63	X		0.7		=	54.91	(82)
Rooflights 0.9x	1	x	0.6	3	X	1	89	x	0.	63	X		0.7	司	=	47.62	(82)
Rooflights 0.9x	1	х	2.1	8	X	1:	57	x	0.	63	x		0.7		=	136.04	(82)
Rooflights 0.9x	1	X	0.7	3	X	1:	57	x	0.	63	= x		0.7	司	=	45.62	(82)
Rooflights 0.9x	1	X	0.6	3	X	1:	57	x	0.	63	X		0.7	司	=	39.56	(82)
Rooflights 0.9x	1	X	2.1	8	X	1	15	x	0.	63	X		0.7	司	=	99.65	(82)
Rooflights 0.9x	1	X	0.7	3	X	1	15	x	0.	63	T x		0.7		=	33.41	(82)
Rooflights 0.9x	1	X	0.6	3	X	1	15	x	0.	63	X		0.7		=	28.98	(82)
Rooflights 0.9x	1	X	2.1	8	X	(66	x	0.	63	X		0.7	司	=	57.19	(82)
Rooflights 0.9x	1	X	0.7	3	X	(66	x	0.	63	i x		0.7		=	19.18	(82)
Rooflights 0.9x	1	x	0.6	3	X	(66	X	0.	63	X		0.7	冒	=	16.63	(82)
Rooflights 0.9x	1	x	2.1	8	X	3	33	X	0.	63	X		0.7	Ħ	=	28.59	(82)
Rooflights 0.9x	1	X	0.7		X		33) x		63	d x		0.7	〓	=	9.59	(82)
Rooflights 0.9x	1	X	0.6		X	3	33	X	0.	63	x		0.7	=	=	8.32	(82)
Rooflights 0.9x	1	X	2.1		X		21) x		63	x		0.7	一	=	18.2	(82)
Rooflights 0.9x	1	X	0.7		X		<u> </u>	X		63	d x		0.7	一	=	6.1	(82)
Rooflights 0.9x	1	X	0.6		X		<u> </u>	X		63	x		0.7	〓	=	5.29	(82)
_																	
Solar gains in	watts, cal	culated	for each	n mont	h			(83)m	n = Sum(74)m	.(82)n	า					
(83)m= 205.34	372.05	563.07	779.71	942.1	9	63.89	917.51	793	.07 63	38.14	426.2	26 2	250.13	172.	.95		(83)
Total gains – i	nternal an	nd solar	(84)m =	(73)m	+ (83)m ,	watts		·	·			,			•	
(84)m= 689.14	853.65	1029.05	1220.35	1356.7	13	353.59	1291.14	117	3.1 10	31.29	844.9	99 6	698.29	643.	.46		(84)
7. Mean inter	nal tempe	erature (heating	seaso	n)												
Temperature		,				area fr	om Tal	ole 9	, Th1 ('	°C)						21	(85)
Utilisation fac	tor for gai	ins for li	ving are	a, h1,r	n (s	ee Tab	le 9a)										
Jan	Feb	Mar	Apr	May	Ì	Jun	Jul	А	ug	Sep	Oc	t	Nov	D	ес		
(86)m= 1	0.99	0.98	0.93	0.81	1	0.63	0.48	0.5	54	0.8	0.96	3	0.99	1			(86)
Mean interna	l tempera	ture in li	iving are	ea T1 (follo	w sten	s 3 to 7	7 in 7	able 9	c)		•					
(87)m= 19.48	19.7	20.04	20.47	20.79	_	20.95	20.99	20.		0.86	20.4	1	19.86	19.4	45		(87)
Tomporaturo	during he	oting no	oriode in	rocto	f du	ollina f	rom To	hlo (Th?	(°C)							
Temperature (88)m= 19.76	19.76	19.76	19.78	19.78	_	9.79	19.79	19.		9.79	19.7	8 T	19.77	19.7	77		(88)
` ′	<u> </u>							<u> </u>	- '	•	. 5.7				-	I	()
Utilisation fac	tor for gai	$\frac{1000}{0.97}$	est of di	velling 0.75	_	m (see	0.35	9a) 0.4	11 /).71	0.94	,	0.99	1			(89)
(89)m= 1	0.99	0.91	0.9	0.75		0.00	<u> </u>	L 0.2	†1 C	<i>y.1</i> 1	0.94	<u> </u>	บ.ฮฮ				(03)

0)m= 17.76	18.08	ature in	19.18	19.59	19.76	19.79	19.79	19.68	19.11	18.33	17.72		(90
17.170	10.00	10.07	10.10	10.00	10.70	10.70	10.70		LA = Livin			0.32	(9
					\			4)					`
Mean intern							<u> </u>		40.50	40.00	40.00		(0)
2)m= 18.31	18.6	19.05	19.59	19.98	20.15	20.18	20.17	20.06	19.53	18.83	18.28		(9)
Apply adjust	1					ì			·	40.00	40.00		(9:
3)m= 18.31	18.6	19.05	19.59	19.98	20.15	20.18	20.17	20.06	19.53	18.83	18.28		(9
3. Space he									. —	>			
Set Ti to the he utilisatio			•		ed at ste	ep 11 of	Table 9	o, so tha	it II,m=(/6)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jtilisation fa				iviay	Juli	Jui	Aug	Sep	Oct	NOV	Dec		
4)m= 0.99	0.99	0.96	0.9	0.76	0.56	0.39	0.45	0.73	0.94	0.99	1		(9
Jseful gains	.	<u> </u>		l	0.50	0.55	0.43	0.73	0.54	0.00	'		(0
5)m= 685	841.27	990.21		1029.15	758.67	505.25	527.9	753.69	793.59	689.62	640.54		(9
						303.23	327.9	733.09	793.39	009.02	040.54		(0
Monthly ave	 					40.0	40.4	444	40.0	7.4	4.0		(9
6)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		(3
leat loss ra	_									1701.01	005400		(6
,	2015.65	1840.63	1548.32	1195.23	791.5	510.49	537.38	854.63	1290.06	1701.94	2054.22		(9
Space heati													
3)m= 1028.7	7 789.19	632.71	327.86	123.56	0	0	0	0	369.37	728.87	1051.78		_
							Tota	I ner vear	(kWh/year) = Sum(9)	8), 50 40 -	5052.11	(9
							Tota	i pei yeai	(ittiii) Juli) G a(8	0)15,912		`
Space heati	ng require	ement in	kWh/m²	²/year			Tota	i per year	(mrring Gar	,	0)15,912	48.2	닠`
•					vstems i	ncludina			(ittiniyodi	, G a(6	0)15,912		(9
a. Energy re	quiremer				/stems i	ncluding			(Arring Gal	,	O/15,912		닠`
a. Energy re Space heat	quiremer	nts – Indi	vidual h	eating sy		J			(KVVIII) Jour	,	O)15,912		(9
a. Energy re Space heat Fraction of s	quiremer ing: pace hea	nts – Indi at from se	vidual h	eating sy		system	micro-C	CHP)	(ttti) joan	,	J15812	0	(9
a. Energy respectively. Space heat raction of services.	equiremer ing: space hea space hea	nts – Indi at from se at from m	vidual he econdary	eating sy y/supple em(s)		system	micro-C (202) = 1	CHP) - (201) =		,	O)15312	0 1	(5)
a. Energy reaction of services	equirement ing: space head space head otal heati	nts – Indi at from se at from m ng from i	vidual h econdary ain syst main sys	eating sy y/supple em(s) stem 1		system	micro-C	CHP) - (201) =		, - Camillo	O)15312	0 1 1	(9)
a. Energy reaction of services	equirement ing: space head space head otal heati	nts – Indi at from se at from m ng from i	vidual h econdary ain syst main sys	eating sy y/supple em(s) stem 1		system	micro-C (202) = 1	CHP) - (201) =		, - Cam(c	J15312	0 1	(2)
a. Energy reaction of seriod of the Efficiency of	equirement ing: pace hea pace hea otal heati main spa	nts – Indi at from se at from m ng from i ace heati	vidual ho econdary nain systemain system	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1	CHP) - (201) =			J15312	0 1 1	(2)
Energy respectively. Energy respectively.	equirement ing: pace hea pace hea otal heati main spa seconda	nts – Indi at from se at from m ng from i ace heati	vidual he econdary ain systemain systemain systementary	eating sy y/supple em(s) stem 1 em 1	mentary	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =			0 1 1 93.5	(9)
Energy respectively. Energy respection of section of the energy of the e	equirement ing: space heat space heat otal heati main spa seconda	nts – Indi at from se at from m ng from i ace heati ary/supple Mar	vidual he econdary nain syst main system ng system ementary	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1	CHP) - (201) =		Nov	Dec	0 1 1 93.5	
Energy reference heat fraction of services of the fraction of	equirement ing: pace heate pace heate otal heati main sparseconda Feb ng require	nts – Indi at from se at from m ng from i ace heati ary/supple Mar	vidual he econdary nain syst main system ng system ementary	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =		Dec	0 1 1 93.5	
Energy respectively. Energy respectively.	equirement ing: space heate otal heati main space seconda Feb ng require 7 789.19	at from seat from mace heating/supplement (c	econdary ain systemain systematary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov		0 1 1 93.5	(x) (x) (x) (x) (x) (x) (x) (x) (x) (x)
Energy respectively. Energy respectively.	equirement ing: space heate pace heate otal heati main space seconda Feb require 7 789.19 8)m x (20	at from set from marger heating mar lement (colors) at from marger heating mar lement (colors) at from the from	econdary eain systemain systementary Apr alculated 327.86 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56	mentary g system Jun 0	system n, % Jul 0	micro-C (202) = 1 - (204) = (204)	Sep	(203)] = Oct 369.37	Nov 728.87	Dec 1051.78	0 1 1 93.5	(9) (2) (2) (2) (2) (2) (2) (2) (3) (4) (4) (5) (5) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7
Energy respectively. Energy respection of section of the energy of the e	equirement ing: space heate pace heate otal heati main space seconda Feb require 7 789.19 8)m x (20	at from seat from mace heating/supplement (c	econdary ain systemain systematary Apr alculated	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 369.37	Nov 728.87 779.54	Dec 1051.78	0 1 1 93.5 0 kWh/y	(2) (3) (4) (4) (5) (5) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7
Energy respectively. Energy respectively.	equirement ing: space heater pace heater p	at from seat from mace heating/supplement (c 632.71 04)] } x 1	econdary nain systemain systematary Apr alculated 327.86 00 ÷ (20 350.65	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 369.37	Nov 728.87 779.54	Dec 1051.78	0 1 1 93.5	(2) (3) (4) (4) (5) (5) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7
Energy reference in Energy reference in Energy reference in Energy reference in Energy of Efficiency of Energy of Energy in En	equirement ing: space heat pace heat	at from seat from mace heating/supplement (c 632.71 04)] } x 1 676.7	econdary nain systemain systematary Apr alculated 327.86 00 ÷ (20 350.65	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 369.37	Nov 728.87 779.54	Dec 1051.78	0 1 1 93.5 0 kWh/y	(2) (3) (4) (4) (5) (5) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7
Energy respectively. Space heat fraction of serection of the energy of	equirement ing: space heat pace heat	at from seat from mace heating/supplement (c 632.71 04)] } x 1 676.7	econdary nain systemain systematary Apr alculated 327.86 00 ÷ (20 350.65	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56	mentary g system Jun 0	system n, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 1 (kWh/yea	(203)] = Oct 369.37	Nov 728.87 779.54	Dec 1051.78	0 1 1 93.5 0 kWh/y	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Space heat fraction of serection of the energy of	equirement ing: space heat pace heat	at from seat from mace heating/supplement (c 632.71 04)] } x 1 676.7	econdary nain systemain systematary Apr alculated 327.86 00 ÷ (20 350.65	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 369.37 395.05 ar) = Sum(2	728.87 779.54 211) _{15,1012}	Dec 1051.78 1124.89	0 1 1 93.5 0 kWh/y	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Space heat fraction of serection of the energy of	equirement ing: space heat pace heat	at from seat from mace heating/supplement (c 632.71 04)] } x 1 676.7	vidual he econdary nain systemain systemain systementary Apr alculated 327.86 00 ÷ (20 350.65	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56 06) 132.15	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 369.37 395.05 ar) =Sum(2	728.87 779.54 211) _{15,1012}	Dec 1051.78 1124.89	0 1 1 93.5 0 kWh/y	((s) ((s) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively. Energy respectively. Energy respectively. Fraction of section of the energy of the energy of the energy of the energy. Energy respectively. Jan. Espace heating the energy of the energy of the energy of the energy. Espace heating ((98) m x (215) m = 0	equirement ing: space heat pace heat otal heat in main space seconda Feb require requ	at from seat from mace heating/supplement (c 632.71 04)] } x 1 676.7	vidual he econdary nain systemain systemain systementary Apr alculated 327.86 00 ÷ (20 350.65	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 123.56 06) 132.15	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 369.37 395.05 ar) = Sum(2	728.87 779.54 211) _{15,1012}	Dec 1051.78 1124.89	0 1 1 93.5 0 kWh/y	((s) ((s) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively. Energy respectively. Energy respectively. Enaction of substitution of substituti	requirement ing: space heat pace hea	at from seat from mace heating/supplement (coordinate) } x 1 676.7	econdary nain systemain systemain systematary Apr alculated 327.86 00 ÷ (20 350.65	eating syly/supple em(s) stem 1 em 1 y heating May d above) 123.56 06) 132.15	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 369.37 395.05 ar) = Sum(2	728.87 779.54 211) _{15,1012}	Dec 1051.78 1124.89	0 1 1 93.5 0 kWh/y	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Epace heati 1028.7 111)m = {[(9 1100.29 Epace heati {[(98)m x (2	equirement ing: space heat pace heat	at from seat from mace heating/supplement (coordinate) } x 1 676.7	econdary nain systemain systemain systematary Apr alculated 327.86 00 ÷ (20 350.65	eating syly/supple em(s) stem 1 em 1 y heating May d above) 123.56 06) 132.15	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 369.37 395.05 ar) = Sum(2	728.87 779.54 211) _{15,1012}	Dec 1051.78 1124.89	0 1 1 93.5 0 kWh/y	(9)

	-	_				ı		1		1	
(,	87.68 86.41	83.9	79.8	79.8	79.8	79.8	86.62	88	88.52		(217)
Fuel for water heating, k\ $(219)m = (64)m \times 100 \div$											
` '	227.29 206.82	2 208.78	196.23	188.53	206.77	206.38	213.94	222.58	237.31]	
	•	•			Tota	l = Sum(2	19a) ₁₁₂ =	•	•	2573.06	(219)
Annual totals							k\	Wh/yeaı	•	kWh/yea	<u>-</u>
Space heating fuel used,	, main syster	n 1								5403.33	
Water heating fuel used										2573.06	
Electricity for pumps, fan	s and electri	c keep-ho	t								
central heating pump:									30]	(230c)
boiler with a fan-assiste	ed flue								45		(230e)
Total electricity for the ab	oove, kWh/ye	ear			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										415.46	(232)
12a. CO2 emissions – I	Individual hea	ating syste	ems inclu	uding mi	cro-CHP						
12a. CO2 emissions – I	Individual hea	ating syste			cro-CHP)	F.m.i.a.a	! -	4	Fusianiana	
12a. CO2 emissions – I	Individual hea	ating syste	En	uding mi ergy /h/year	cro-CHP		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
12a. CO2 emissions – I		ating syste	En kW	ergy	cro-CHP			2/kWh	tor =		
	stem 1)	ating syste	En kW (211	ergy /h/year	cro-CHP		kg CO	2/kWh		kg CO2/ye	ar
Space heating (main sys	stem 1)	ating syste	En kW (211	ergy /h/year	cro-CHP		kg CO	2/kWh	=	kg CO2/ye	ar (261)
Space heating (main sys	stem 1) ry)	ating syste	En kW (211 (215	ergy /h/year i) x 5) x	cro-CHP + (263) + (0.2°	2/kWh	=	kg CO2/ye	(261) (263)
Space heating (main sys Space heating (secondar Water heating	stem 1) ry)		En kW (211 (215 (219	ergy /h/year i) x 5) x			0.2°	2/kWh 16 19	=	kg CO2/ye 1167.12 0 555.78	(261) (263) (264)
Space heating (main sys Space heating (secondar Water heating Space and water heating	stem 1) ry)		En kW (211 (215 (219 (261 t (231	ergy /h/year i) x 5) x 9) x			0.2°	2/kWh 16 19 16	= = =	kg CO2/ye 1167.12 0 555.78 1722.9	(261) (263) (264) (265)
Space heating (main sys Space heating (secondar Water heating Space and water heating Electricity for pumps, fan	stem 1) ry)		En kW (211 (215 (219 (261 t (231	ergy /h/year 1) x 5) x 9) x 1) + (262)		(264) =	0.2° 0.5° 0.5°	2/kWh 16 19 16 19 19	= = =	kg CO2/ye 1167.12 0 555.78 1722.9 38.93	(261) (263) (264) (265) (267)
Space heating (main system) Space heating (secondary Water heating Space and water heating Electricity for pumps, fant Electricity for lighting	stem 1) ry)		En kW (211 (215 (219 (261 t (231	ergy /h/year 1) x 5) x 9) x 1) + (262)		(264) =	0.2° 0.5° 0.5° 0.5°	2/kWh 16 19 16 19 19	= = =	kg CO2/ye 1167.12 0 555.78 1722.9 38.93 215.62	(261) (263) (264) (265) (267) (268)

TER =

(273)

27.91

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II.3. Be Lean

		Jser Details:				
Assessor Name:	Su Lee	Stroma Num	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Versio	n: 1.0.4.16	
	Pro	perty Address: Unit 01	1			
Address :	138-140 Highgate Road, High	gate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:				\	
Basement		Area(m²) 42.14 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)
Ground floor		36.79 (1b) x	3.2	(2b) =	117.73	(3b)
First floor		34.79 (1c) x	4.65	(2c) =	161.77	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	113.72 (4)		_		
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	(3n) =	393.28	(5)
2. Ventilation rate:				_		
	main secondary heating heating	other	total		m³ per hou	٢
Number of chimneys		+ 0 =	0 x	40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x	20 =	0	(6b)
Number of intermittent fa	ns		5 ×	10 =	50	(7a)
Number of passive vents			0 x	10 =	0	(7b)
Number of flueless gas fi	res		0 x	40 =	0	(7c)
				Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)	+(7b)+(7c) =	50	÷ (5) =	0.13	(8)
If a pressurisation test has b	een carried out or is intended, proceed i	to (17), otherwise continue f	from (9) to (16)	_		_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				-1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0	•	ruction		0	(11)
if both types of wall are pa deducting areas of openir	resent, use the value corresponding to th nas): if equal user 0.35	ne greater wall area (after				
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0			0	(12)
If no draught lobby, en	ter 0.05, else enter 0			Ì	0	(13)
Percentage of windows	s and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square m	netre of envelope	area	4	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		Ī	0.33	(18)
Air permeability value applie	s if a pressurisation test has been done	or a degree air permeability	is being used	•		_
Number of sides sheltere	ed				1	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =		0.92	(20)
Infiltration rate incorporat	ing shelter factor	(21) = (18) x (20) =		[0.3	(21)
Infiltration rate modified f	or monthly wind speed	, ,	, ,	,		
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (22a)m = (22	m ÷ 4										
	23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltration rate (a	louing for	oboltor on	d wind a	annad)	(210) ×	(22a)m		ı			
Adjusted infiltration rate (a	37 0.33	0.33	0.29	0.29	0.28	0.3	0.33	0.34	0.36		
Calculate effective air cha			1	l	0.20	0.0	0.55	0.04	0.50		
If mechanical ventilation	•									0	(23a)
If exhaust air heat pump using	Appendix N,	(23b) = (23a)	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with heat recovery	efficiency in	% allowing	for in-use f	actor (from	Table 4h) =				0	(23c)
a) If balanced mechanic		1	1	- 	- 	ŕ	- 		— `	÷ 100]	
(2)	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanic		1			- ` ` - 	í `	 	<u> </u>			(5.41)
(1)	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extrac		•	•				E (22h	. \			
if $(22b)m < 0.5 \times (23)$	b), then (2	$\frac{4c}{1} = (23)$	o); otnerv	wise (24)	C) = (220)	0) m + 0.	.5 × (230	0	0		(24c)
(1)									U		(240)
d) If natural ventilation of if (22b)m = 1, then (0.5]				
	57 0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air change rate	- enter (24	la) or (24l	o) or (24	c) or (24	d) in box	· (25)					
	57 0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
` '			I	0.0	l		1	0.50			
	oss paramo	eter:		0.01		l		0.30			
3. Heat losses and heat I ELEMENT Gross	Oper	ings	Net Ar	ea	U-valı		A X U		k-value		A X k
3. Heat losses and heat I ELEMENT Gross area (m²	Oper		Net Ar A ,r	ea n²	U-valı W/m2	:K	(W/I		k-value kJ/m²-ł		kJ/K
3. Heat losses and heat I ELEMENT Gross area (m² Doors	Oper	ings	Net Ar A ,r 2.46	ea m² ×	U-valı W/m2	=	(W/I				kJ/K (26)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1	Oper	ings	Net Ar A ,r 2.46	ea m² x 1/2	U-valı W/m2 1.4 /[1/(1.4)+	= 0.04] =	(W/I 3.444 6.44				kJ/K (26) (27)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2	Oper	ings	Net Ar A ,r 2.46 4.86 5.19	ea m² x 1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+	0.04] = 0.04] =	(W/I 3.444 6.44 6.88				kJ/K (26) (27) (27)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3	Oper	ings	Net Ar A ,r 2.46 4.86 5.19	ea m² x 1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.88 1.86				kJ/K (26) (27) (27) (27)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4	ea m² x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.88 1.86 6.44				kJ/K (26) (27) (27) (27) (27)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38	ea m² x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.88 1.86 6.44 9.78				kJ/K (26) (27) (27) (27) (27) (27)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83	ea m² x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73				kJ/K (26) (27) (27) (27) (27) (27) (27)
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1 Rooflights Type 2	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1 Rooflights Type 2 Rooflights Type 3	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1 Rooflights Type 2	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1 Rooflights Type 2 Rooflights Type 3	Oper	ings	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582 1.918	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1 Rooflights Type 2 Rooflights Type 3 Floor	Oper	ings m²	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13 42.14	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582 1.918	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Heat losses and heat I ELEMENT Gross area (m² Doors Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Rooflights Type 1 Rooflights Type 2 Rooflights Type 3 Floor Walls Type1 12.61	Oper	ings m²	Net Ar A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13 1.37 42.14	ea m² x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	U-valu W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582 1.918 5.47819	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Walls Type5	14.63	0	14.63	x	0.15	=	2.19				(29)
Walls Type6	1.7	0	1.7	x	0.15	=	0.26		\Box [(29)
Walls Type7	13.5	0	13.5	X	0.15	=	2.03		\Box [(29)
Walls Type8	5.22	0	5.22	x	0.15	=	0.78		\Box [(29)
Walls Type9	5.76	4.86	0.9	x	0.15	=	0.14		\Box [(29)
Walls Type10	0.42	0	0.42	x	0.15	=	0.06		\Box [(29)
Walls Type11	6.18	0	6.18	x	0.15	=	0.93				(29)
Walls Type12	15.33	0	15.33	x	0.15	=	2.3		\Box [(29)
Walls Type13	2.02	0	2.02	x	0.15	=	0.3				(29)
Walls Type14	16	0	16	x	0.15] =	2.4		\Box [(29)
Walls Type15	11.53	6.71	4.82	x	0.15] =	0.72		\Box [(29)
Walls Type16	2	0	2	x	0.15	_	0.3		\Box [(29)
Walls Type17	9.63	2.46	7.17	x	0.15	_	1.08		\Box [(29)
Walls Type18	9.3	0	9.3	x	0.15	=	1.4		\Box [(29)
Walls Type19	0.6	0	0.6	x	0.15	=	0.09		\Box [(29)
Walls Type20	10.04	5.83	4.21	x	0.15] =	0.63				(29)
Walls Type21	5.77	0	5.77	x	0.15	=	0.87				(29)
Walls Type22	1.91	0	1.91	x	0.15	=	0.29		\Box [(29)
Walls Type23	17.21	0	17.21	x	0.15	=	2.58		\Box [(29)
Walls Type24	2.65	0	2.65	x	0.15	=	0.4		\Box [(29)
Walls Type25	16.14	0	16.14	x	0.15	=	2.42		\Box [(29)
Walls Type26	3.94	0	3.94	x	0.15	=	0.59		\Box [(29)
Walls Type27	9.7	7.38	2.32	x	0.15	=	0.35		\Box [(29)
Walls Type28	5.81	3.36	2.45	x	0.15	=	0.37		\Box [(29)
Roof Type1	33.58	4.48	29.1	x	0.13	=	3.78		\Box [(30)
Roof Type2	4.01	1.37	2.64	x	0.13	=	0.34				(30)
Total area of ele	ements, m²		290.94]							(31)
Party wall			27.41	x	0	=	0		\Box [(32)
Party wall			27.94	x	0	=	0		\Box [(32)
Party wall			40	x	0	=	0		\Box [(32)
		effective window U-v internal walls and par		using	formula 1/[(1/	U-valu	ue)+0.04] as g	iven in paragrapl	1 3.2		
Fabric heat loss	W/K = S(A)	(U)			(26)(30) + (32) =			98	3.66	(33)
Heat capacity C	m = S(A x k)					((28).	(30) + (32) +	(32a)(32e) =		0	(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium (35)250

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

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

if details of thermal bridging are not known (36) = $0.15 \times (31)$

Total fabric heat loss (33) + (36) =(37) 117.34

(38)m = $0.33 \times (25)$ m x (5)

Ventilation heat loss calculated monthly

Jan Feb Mar May Jun Jul Sep Oct Nov Dec Apr Aug

(36)

18.67

													l	(0.0)
(38)m=	74.55	74.18	73.81	72.08	71.76	70.25	70.25	69.98	70.83	71.76	72.41	73.09	I	(38)
	ansfer c								· · · ·	= (37) + (3			l	
(39)m=	191.89	191.51	191.14	189.42	189.09	187.59	187.59	187.31	188.17	189.09	189.75	190.43	400.44	7(20)
Heat lo	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	189.41	(39)
(40)m=	1.69	1.68	1.68	1.67	1.66	1.65	1.65	1.65	1.65	1.66	1.67	1.67		_
Numbe	er of day	s in moi	nth (Tabl	le 1a)					/	Average =	Sum(40) _{1.}	12 /12=	1.67	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Δeeum	ed occu	nancy I	N									0.4		(42)
if TF		N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		84		(42)
		•	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		10	1.54		(43)
		_		• .		-	-	to achieve	a water us	se target o	r '			
riot more			person per	, ,		_						_	1	
Hot wot	Jan	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 Y	Aug	Sep	Oct	Nov	Dec	I	
								. /					1	
(44)m=	111.69	107.63	103.57	99.51	95.45	91.39	91.39	95.45	99.51	103.57	107.63	111.69		
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1218.49	(44)
(45)m=	165.64	144.87	149.49	130.33	125.06	107.91	100	114.75	116.12	135.33	147.72	160.41		
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Γotal = Su	m(45) ₁₁₂ =	=	1597.63	(45)
(46)m=	24.85	21.73	22.42	19.55	18.76	16.19	15	17.21	17.42	20.3	22.16	24.06		(46)
` '	storage		22.72	10.00	10.70	10.13	10	17.21	17.42	20.0	22.10	24.00		(1.5)
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		210		(47)
If com	munity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	icludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
	storage			(. /1.14/1	1.1- \						l	
•			eclared l		or is kno	wn (kvvr	ı/day):					57	1	(48)
•			m Table								0.	54	 	(49)
•			storage eclared o	-		or is not		(48) x (49)) =		0.	85	I	(50)
•			factor fr	-								0		(51)
		_	ee sectio		- (,					0		(- /
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or (54) in (5	55)								0.	85		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)r	m				
(56)m=	26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(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=	26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(57)

Primary circuit loss (annual) from Table 3			C)		(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)	m				
(modified by factor from Table H5 if there is solar water	er heating and a	cylinder thermo	stat)			
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51	23.26 23.26	22.51 23.26	22.51	23.26		(59)
Combi loss calculated for each month (61)m = (60) ÷ 36	55 × (41)m					
(61)m= 0 0 0 0 0 0	0 0	0 0	0	0		(61)
Total heat required for water heating calculated for each	month (62)m =	0.85 × (45)m +	(46)m + ((57)m + (59)m + (61)m	
(62)m= 215.18 189.62 199.04 178.28 174.6 155.86	149.54 164.29	164.07 184.87	195.67	209.96	(-)	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative	re quantity) (enter '0	if no solar contribut	ion to wate	r heating)		
(add additional lines if FGHRS and/or WWHRS applies,				0,		
(63)m= 0 0 0 0 0 0	0 0	0 0	0	0		(63)
Output from water heater	<u> </u>	L L	!!			
(64)m= 215.18 189.62 199.04 178.28 174.6 155.86	149.54 164.29	164.07 184.87	195.67	209.96		
		out from water heate	LL r (annual)₁	12	2180.98	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85]				_		ı
(65)m= 94.71 83.97 89.34 81.69 81.22 74.24	72.88 77.79	76.97 84.63	87.47	92.97	l	(65)
include (57)m in calculation of (65)m only if cylinder is					ating	` /
	sin the aweiling	of flot water is if	OIII COIIII	Tidriity Tie	aurig	
5. Internal gains (see Table 5 and 5a):						
Metabolic gains (Table 5), Watts	11	Com Oot	Nevi	Dag		
Jan Feb Mar Apr May Jun	Jul Aug 141.77 141.77	Sep Oct 141.77	Nov 141.77	Dec 141.77		(66)
			141.77	141.77		(00)
Lighting gains (calculated in Appendix L, equation L9 or			00.70	05.00		(67)
(67)m= 24.68 21.92 17.82 13.49 10.09 8.52	9.2 11.96	16.05 20.38	23.79	25.36		(67)
Appliances gains (calculated in Appendix L, equation L1						(22)
(68)m= 276.8 279.67 272.43 257.02 237.57 219.29	207.08 204.2	211.44 226.85	246.3	264.58		(68)
Cooking gains (calculated in Appendix L, equation L15	or L15a), also se	ee Table 5				
(69)m= 37.18 37.18 37.18 37.18 37.18 37.18	37.18 37.18	37.18 37.18	37.18	37.18		(69)
Pumps and fans gains (Table 5a)						
(70)m= 3 3 3 3 3 3	3 3	3 3	3	3		(70)
Losses e.g. evaporation (negative values) (Table 5)						
(71)m= -113.42 -113.42 -113.42 -113.42 -113.42 -113.42	-113.42 -113.42	-113.42 -113.42	-113.42	-113.42		(71)
Water heating gains (Table 5)						
(72)m= 127.3 124.95 120.08 113.46 109.16 103.11	97.96 104.56	106.9 113.75	121.49	124.96		(72)
Total internal gains = (66)	m + (67)m + (68)m +	+ (69)m + (70)m + (7	1)m + (72)r	m		
(73)m= 497.3 495.07 478.87 452.51 425.35 399.44	382.77 389.25	402.93 429.52	460.12	483.44		(73)
6. Solar gains:						
Solar gains are calculated using solar flux from Table 6a and associate	ated equations to co	nvert to the applicat	ole orientati	on.		
Orientation: Access Factor Area Flux		g_	FF		Gains	
Table 6d m² Tab	ole 6a T	able 6b T	able 6c		(W)	
Northeast 0.9x 0.77 x 7.38 x 1	1.28 X	0.76 ×	0.7	=	30.7	(75)
Northeast 0.9x 0.77 x 6.71 x 1	1.28 X	0.76 X	0.7	=	27.91	(75)

N 0		1		1		1		1		1		_
Northeast _{0.9x}	0.77	X	7.38	X	22.97	X	0.76	X	0.7	=	62.49	(75)
Northeast _{0.9x}	0.77	X	6.71	X	22.97	X	0.76	X	0.7	=	56.82	(75)
Northeast _{0.9x}	0.77	X	7.38	X	41.38	X	0.76	X	0.7] =	112.58	(75)
Northeast _{0.9x}	0.77	X	6.71	X	41.38	X	0.76	X	0.7	=	102.36	(75)
Northeast _{0.9x}	0.77	X	7.38	X	67.96	X	0.76	X	0.7	=	184.9	(75)
Northeast _{0.9x}	0.77	X	6.71	X	67.96	X	0.76	X	0.7	=	168.11	(75)
Northeast 0.9x	0.77	X	7.38	X	91.35	X	0.76	X	0.7	=	248.54	(75)
Northeast _{0.9x}	0.77	X	6.71	X	91.35	X	0.76	X	0.7	=	225.97	(75)
Northeast _{0.9x}	0.77	X	7.38	X	97.38	X	0.76	X	0.7	=	264.97	(75)
Northeast 0.9x	0.77	X	6.71	X	97.38	X	0.76	x	0.7	=	240.91	(75)
Northeast _{0.9x}	0.77	X	7.38	X	91.1	X	0.76	X	0.7	=	247.87	(75)
Northeast _{0.9x}	0.77	X	6.71	X	91.1	X	0.76	X	0.7	=	225.37	(75)
Northeast _{0.9x}	0.77	X	7.38	x	72.63	X	0.76	x	0.7	=	197.61	(75)
Northeast _{0.9x}	0.77	X	6.71	x	72.63	x	0.76	x	0.7	=	179.67	(75)
Northeast _{0.9x}	0.77	X	7.38	x	50.42	X	0.76	x	0.7	=	137.19	(75)
Northeast _{0.9x}	0.77	X	6.71	x	50.42	X	0.76	x	0.7	=	124.73	(75)
Northeast _{0.9x}	0.77	X	7.38	x	28.07	X	0.76	X	0.7	=	76.37	(75)
Northeast _{0.9x}	0.77	X	6.71	x	28.07	X	0.76	X	0.7	=	69.43	(75)
Northeast _{0.9x}	0.77	x	7.38	x	14.2	x	0.76	x	0.7] =	38.63	(75)
Northeast _{0.9x}	0.77	x	6.71	×	14.2	x	0.76	x	0.7] =	35.12	(75)
Northeast _{0.9x}	0.77	x	7.38	x	9.21	x	0.76	x	0.7	j =	25.07	(75)
Northeast _{0.9x}	0.77	x	6.71	x	9.21	x	0.76	x	0.7] =	22.79	(75)
Southwest _{0.9x}	0.77	х	4.86	x	36.79	j	0.76	x	0.7	j =	65.93	(79)
Southwest _{0.9x}	0.77	x	5.19	x	36.79	j	0.76	x	0.7	j =	70.4	(79)
Southwest _{0.9x}	0.77	x	4.86	x	36.79	j	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	х	5.83	x	36.79	j	0.76	x	0.7	j =	79.08	(79)
Southwest _{0.9x}	0.77	x	4.86	x	62.67	j	0.76	x	0.7	j =	112.3	(79)
Southwest _{0.9x}	0.77	х	5.19	x	62.67	j	0.76	x	0.7	j =	119.92	(79)
Southwest _{0.9x}	0.77	х	4.86	x	62.67	j	0.76	x	0.7	j =	112.3	(79)
Southwest _{0.9x}	0.77	x	5.83	x	62.67	j	0.76	x	0.7	j =	134.71	(79)
Southwest _{0.9x}	0.77	x	4.86	x	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	x	5.19	x	85.75	j	0.76	x	0.7	j =	164.08	(79)
Southwest _{0.9x}	0.77	x	4.86	x	85.75	į	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	5.83	x	85.75	j	0.76	x	0.7	j =	184.32	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	İ	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	X	5.19	x	106.25	į	0.76	x	0.7	=	203.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	5.83	X	106.25	ĺ	0.76	x	0.7	=	228.38	(79)
Southwest _{0.9x}	0.77) x	4.86	X	119.01	ĺ	0.76	x	0.7	, =	213.24	(79)
Southwest _{0.9x}	0.77	X	5.19	X	119.01		0.76	x	0.7] =	227.72	(79)
Southwest _{0.9x}	0.77	X	4.86	X	119.01		0.76	x	0.7] =	213.24	(79)
L	<u> </u>	1		1		ı		ı	-		<u> </u>	_

Southwest _{0.9x}	0.77	1 ,	5.00	1 .	440.04	1	0.70	l "	0.7	1 _	255.0	(79)
Southwest _{0.9x}	0.77] X] ,,	5.83] X] ,	119.01]]	0.76	X	0.7] =] _	255.8	=
Southwest _{0.9x}	0.77] X] ,,	4.86	X	118.15]]	0.76	X	0.7] = _	211.7	(79)
Southwest _{0.9x}	0.77]	5.19] X] v	118.15]]	0.76	X	0.7] = _	226.07	(79) (79)
Southwest _{0.9x}	0.77] X] ,	4.86] X] ,	118.15]]	0.76	X	0.7] =] _	211.7	$ = \begin{pmatrix} 79 \\ (79) \end{pmatrix} $
Southwest _{0.9x}	0.77] X] _v	5.83] X] v	118.15]]	0.76	X] =] _	253.95	$= \frac{(79)}{(79)}$
Southwest _{0.9x}	0.77	」 x] x	4.86	x x	113.91]]	0.76	x	0.7] =] =	204.1	(79)
Southwest _{0.9x}	0.77	」^] _×	5.19 4.86] ^] x	113.91]]	0.76	X	0.7]	217.96	(79)
Southwest _{0.9x}	0.77	」^] ×	5.83] ^] x	113.91]]	0.76	X	0.7] -] =	244.83	(79)
Southwest _{0.9x}	0.77	」^] ×	4.86] ^] x	104.39]]	0.76	X	0.7]	187.04	(79)
Southwest _{0.9x}	0.77	」^] ×	5.19] ^] x	104.39]]	0.76	X	0.7] -] =	199.74	(79)
Southwest _{0.9x}	0.77	」^] _×	4.86] ^] x	104.39]]	0.76	X	0.7] -] =	187.04	(79)
Southwest _{0.9x}	0.77	」^] ×	5.83] ^] x	104.39]]	0.76	X	0.7] -] =	224.37	(79)
Southwest _{0.9x}	0.77	」^] _×	4.86] ^] x	92.85]]	0.76	X	0.7] -] =	166.37	(79)
Southwest _{0.9x}	0.77] ^] x	5.19] ^] x	92.85]]	0.76	X	0.7] -] =	177.67	(79)
Southwest _{0.9x}	0.77] ^] _x	4.86] ^] x	92.85]]	0.76	X	0.7]	166.37	(79)
Southwest _{0.9x}	0.77] ^] x	5.83] ^] x	92.85]]	0.76	X	0.7] -] =	199.57	(79)
Southwest _{0.9x}	0.77] ^] x	4.86] ^] x	69.27]]	0.76	x	0.7]	124.11	(79)
Southwest _{0.9x}	0.77] ^] _X	5.19	l x	69.27]]	0.76	x	0.7]	132.54	(79)
Southwest _{0.9x}	0.77] ^] _x	4.86] ^] x	69.27]]	0.76	x	0.7]	124.11	(79)
Southwest _{0.9x}	0.77]	5.83) ^] x	69.27	! 	0.76	x	0.7]] =	148.88	(79)
Southwest _{0.9x}	0.77]	4.86] ^] x	44.07]]	0.76	x	0.7]]	78.96	(79)
Southwest _{0.9x}	0.77]	5.19) ^] x	44.07]]	0.76	x	0.7	!] ₌	84.33	(79)
Southwest _{0.9x}	0.77] x	4.86] x	44.07	!]	0.76	x	0.7]]	78.96	(79)
Southwest _{0.9x}	0.77	」 】 x	5.83]] _x	44.07	!]	0.76	X	0.7]] ₌	94.72	(79)
Southwest _{0.9x}	0.77	」] _X	4.86]] x	31.49	!]	0.76	x	0.7]]	56.42	(79)
Southwest _{0.9x}	0.77]]	5.19]] x	31.49	! 	0.76	X	0.7] =	60.25	(79)
Southwest _{0.9x}	0.77	X	4.86) x	31.49	! 	0.76	X	0.7	, =	56.42	(79)
Southwest _{0.9x}	0.77	X	5.83	X	31.49	İ	0.76	x	0.7	, =	67.68	(79)
Northwest 0.9x	0.77	X	1.4	X	11.28	X	0.76	x	0.7	, =	5.82	(81)
Northwest _{0.9x}	0.77	X	3.36	x	11.28	x	0.76	X	0.7	=	13.98	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest 0.9x	0.77	X	3.36	x	22.97	x	0.76	х	0.7	=	28.45	(81)
Northwest _{0.9x}	0.77	j×	1.4	x	41.38	x	0.76	х	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	3.36	x	41.38	x	0.76	х	0.7	=	51.26	(81)
Northwest _{0.9x}	0.77	×	1.4	x	67.96	x	0.76	x	0.7	j =	35.08	(81)
Northwest _{0.9x}	0.77	X	3.36	x	67.96	x	0.76	x	0.7	=	84.18	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	i =	47.15	(81)
Northwest _{0.9x}	0.77	j×	3.36	x	91.35	x	0.76	x	0.7	j =	113.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	3.36	x	97.38	x	0.76	x	0.7	=	120.64	(81)
		-		•		•		•	•	•		_

Northwest _{0.9x}	0.77	1 x	1.4	l x	91.1] x	0.76	x	0.7	1 =	47.02	(81)
Northwest 0.9x	0.77]	3.36	l ^ l x	91.1] ^] _x	0.76	X	0.7]	112.85	(81)
Northwest 0.9x	0.77]	1.4] ^] x	72.63] ^] _x	0.76	X	0.7]	37.49	(81)
Northwest 0.9x	0.77] x	3.36] x	72.63] x	0.76	x	0.7]] =	89.97	(81)
Northwest 0.9x	0.77]]	1.4]]	50.42]] _x	0.76	x	0.7]] =	26.02	(81)
Northwest 0.9x	0.77] x	3.36	l x	50.42] x	0.76	x	0.7]] =	62.46	(81)
Northwest 0.9x	0.77]]	1.4]]	28.07]] _x	0.76	X	0.7]] =	14.49	(81)
Northwest _{0.9x}	0.77	X	3.36	l X	28.07]]	0.76	X	0.7] =	34.77	(81)
Northwest _{0.9x}	0.77	X	1.4	X	14.2	X	0.76	x	0.7	j =	7.33	(81)
Northwest 0.9x	0.77	X	3.36	x	14.2	X	0.76	X	0.7	=	17.59	(81)
Northwest _{0.9x}	0.77	X	1.4	x	9.21	x	0.76	x	0.7	j =	4.76	(81)
Northwest _{0.9x}	0.77	x	3.36	x	9.21	x	0.76	x	0.7	j =	11.41	(81)
Rooflights _{0.9x}	1	X	3.35	x	26	x	0.76	x	0.7	j =	41.7	(82)
Rooflights _{0.9x}	1	x	1.13	x	26	x	0.76	x	0.7	j =	14.07	(82)
Rooflights _{0.9x}	1	x	1.37	x	26	x	0.76	x	0.7	=	17.05	(82)
Rooflights _{0.9x}	1	x	3.35	x	54	x	0.76	x	0.7	=	86.61	(82)
Rooflights _{0.9x}	1	x	1.13	x	54	x	0.76	x	0.7] =	29.22	(82)
Rooflights _{0.9x}	1	X	1.37	x	54	x	0.76	x	0.7	=	35.42	(82)
Rooflights _{0.9x}	1	x	3.35	x	96	x	0.76	x	0.7	=	153.98	(82)
Rooflights 0.9x	1	X	1.13	x	96	x	0.76	x	0.7	=	51.94	(82)
Rooflights _{0.9x}	1	X	1.37	x	96	x	0.76	x	0.7	=	62.97	(82)
Rooflights _{0.9x}	1	X	3.35	x	150	x	0.76	x	0.7	=	240.6	(82)
Rooflights _{0.9x}	1	X	1.13	x	150	x	0.76	x	0.7	=	81.16	(82)
Rooflights _{0.9x}	1	X	1.37	x	150	X	0.76	x	0.7	=	98.39	(82)
Rooflights _{0.9x}	1	X	3.35	x	192	x	0.76	x	0.7	=	307.96	(82)
Rooflights _{0.9x}	1	X	1.13	x	192	x	0.76	x	0.7	=	103.88	(82)
Rooflights _{0.9x}	1	X	1.37	x	192	X	0.76	x	0.7	=	125.94	(82)
Rooflights _{0.9x}	1	X	3.35	x	200	x	0.76	x	0.7	=	320.8	(82)
Rooflights _{0.9x}	1	X	1.13	x	200	X	0.76	X	0.7	=	108.21	(82)
Rooflights 0.9x	1	X	1.37	x	200	x	0.76	X	0.7	=	131.19	(82)
Rooflights _{0.9x}	1	X	3.35	X	189	X	0.76	X	0.7	=	303.15	(82)
Rooflights _{0.9x}	1	X	1.13	X	189	X	0.76	X	0.7	=	102.26	(82)
Rooflights 0.9x	1	X	1.37	X	189	X	0.76	X	0.7	=	123.98	(82)
Rooflights 0.9x	1	X	3.35	X	157	X	0.76	X	0.7	=	251.82	(82)
Rooflights 0.9x	1	X	1.13	X	157	X	0.76	X	0.7	=	84.94	(82)
Rooflights 0.9x	1	X	1.37	x	157	x	0.76	X	0.7	=	102.99	(82)
Rooflights 0.9x	1	X	3.35	X	115	X	0.76	X	0.7	=	184.46	(82)
Rooflights 0.9x	1	X	1.13	x	115	X	0.76	X	0.7	=	62.22	(82)
Rooflights 0.9x	1	X	1.37	x	115	X	0.76	X	0.7	=	75.43	(82)
Rooflights 0.9x	1	X	3.35	X	66	X	0.76	X	0.7] =	105.86	(82)
Rooflights _{0.9x}	1	X	1.13	X	66	X	0.76	X	0.7	=	35.71	(82)

Rooflights 0.9x	1	X	1.3	7	x		66	x		0.76	x [0.7	=	43.29	(82)
Rooflights 0.9x	1	X	3.3	5	x		33	x		0.76	x	0.7	=	52.93	(82)
Rooflights 0.9x	1	X	1.1	3	x		33	х		0.76	x	0.7	=	17.85	(82)
Rooflights 0.9x	1	x	1.3	7	x		33	х		0.76	x	0.7	=	21.65	(82)
Rooflights 0.9x	1	X	3.3	5	x		21	x		0.76	_ x [0.7	=	33.68	(82)
Rooflights 0.9x	1	x	1.1	3	x		21	х		0.76	x	0.7	_	11.36	(82)
Rooflights 0.9x	1	x	1.3	7	x		21	х		0.76		0.7	=	13.78	(82)
_					'			•							
Solar gains in v	watts, ca	lculated	for eacl	n month				(83)m	n = St	um(74)m .	(82)m				
(83)m= 432.57	790.08	1212.15	1704.84	2082.6	21	40.39	2033.49	1742	2.68	1382.49	909.56	528.07	363.62		(83)
Total gains – ir	nternal a	nd solar	(84)m =	: (73)m ·	+ (8	33)m ,	watts							_	
(84)m= 929.88	1285.15	1691.02	2157.35	2507.95	25	39.83	2416.26	2131	1.93	1785.42	1339.08	988.19	847.06		(84)
7. Mean intern	nal temp	erature	(heating	season)										
Temperature						area f	rom Tab	ole 9.	, Th	1 (°C)				21	(85)
Utilisation fac	•	٠.			-				,	()					`
Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.93	0.81	0.63	().46	0.34	0.4	 	0.65	0.91	0.98	1		(86)
Mean internal	tompor	atura in l	living or	22 T1 (fc	ر مالد	w ctor	oc 2 to 7	in T	l	. 00)		1		l .	
(87)m= 19.28	19.63	20.1	20.6	20.87		0.97	20.99	20.		20.9	20.44	19.74	19.22		(87)
					<u> </u>						20.11	1 .0.7 .	10.22		(-)
Temperature						Ť				<u> </u>	00.47	T 00.47	I 00.40	l	(00)
(88)m= 20.16	20.16	20.16	20.17	20.17		0.18	20.18	20.	18	20.17	20.17	20.17	20.16		(88)
Utilisation fac	tor for ga	ains for r	est of d	welling,	h2,	m (se	e Table	9a)						1	
(89)m= 0.99	0.97	0.92	0.79	0.59		0.4	0.28	0.3	33	0.59	0.89	0.98	0.99		(89)
Mean internal	tempera	ature in t	the rest	of dwelli	ng	T2 (fc	ollow ste	ps 3	to 7	in Tabl	e 9c)			_	
(90)m= 18.56	18.9	19.37	19.84	20.08	2	0.16	20.17	20.	17	20.11	19.7	19.03	18.51		(90)
										f	LA = Livi	ng area ÷ (4	4) =	0.33	(91)
Mean internal	tempera	ature (fo	r the wh	ole dwe	lling	g) = fL	.A × T1	+ (1	– fL	A) × T2					
(92)m= 18.8	19.14	19.61	20.09	20.34	2	0.43	20.44	20.	44	20.37	19.95	19.26	18.74		(92)
Apply adjustm	nent to th	ne mean	internal	temper	atu	re fro	m Table	4e,	whe	re appro	priate			I	
(93)m= 19.4	19.74	20.21	20.69	20.94	2	1.03	21.04	21.	04	20.97	20.55	19.86	19.34		(93)
8. Space heat	ting requ	iirement													
Set Ti to the r					ed	at ste	p 11 of	Tabl	le 9b	, so tha	t Ti,m=	(76)m an	d re-calc	ulate	
the utilisation	i				_	. 1				_		1		I	
Jan Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
Utilisation faction (94)m= 0.99	0.97	0.92	0.8	0.63		0.46	0.34	0.4	<u>, </u>	0.65	0.9	0.98	0.99	1	(94)
Useful gains,						7.40	0.54	0.		0.00	0.9	0.90	0.99		(01)
	i	1558.69			11	67.48	823.96	852	.14	1159.69	1206.26	968.06	841.1		(95)
Monthly avera							0_000					1		l	, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for mea	an intern	al tempe	erature,	Lm	, W =	:[(39)m	x [(9:	 3)m-	- (96)m]	1		1	
(97)m= 2897.46		2620.3	2232.71	1747.31	_	05.69	833.52	869		1292.48		2421.8	2883.67		(97)
Space heating	g require	ement fo	r each m	onth, k	Nh	/mont	h = 0.02	4 x [(97)	m – (95)m] x (4	11)m		_	
(98)m= 1470.58	1070.89	789.84	358.5	122.1		0	0	0)	0	501.68	1046.69	1519.67		

Total per year (kWh/year) = Sum(98) _{15,9}	2 = 6879.95	(98)
Space heating requirement in kWh/m²/year	60.5	(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	85.4	(206)
Efficiency of secondary/supplementary heating system, %	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	ec kWh/ye	ar
Space heating requirement (calculated above)	67	
1470.58 1070.89 789.84 358.5 122.1 0 0 0 501.68 1046.69 1519	.67	
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ 1721.99 1253.96 924.87 419.79 142.97 0 0 0 0 587.45 1225.63 1779 $	47	(211)
Total (kWh/year) =Sum(211) _{15.1012} =	8056.15	(211)
Space heating fuel (secondary), kWh/month	0000.10	
$= \{[(98)m \times (201)]\} \times 100 \div (208)$		
(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) 215.18 189.62 199.04 178.28 174.6 155.86 149.54 164.29 164.07 184.87 195.67 209.	96	
Efficiency of water heater	75.3	(216)
(217)m= 88.14 87.75 86.89 84.76 80.86 75.3 75.3 75.3 85.77 87.63 88.2	25	(217)
Fuel for water heating, kWh/month		
(219) m = (64) m x $100 \div (217)$ m (219) m= 244.13 216.08 229.06 210.34 215.93 206.99 198.6 218.19 217.88 215.55 223.28 237.89	01	
$\frac{\text{(219)}_{113}}{\text{Total}} = \frac{244.13}{210.00} \frac{\text{210.00}}{\text{229.00}} \frac{\text{210.34}}{\text{210.34}} \frac{\text{213.95}}{\text{210.39}} \frac{\text{200.99}}{\text{190.0}} \frac{\text{190.0}}{\text{210.19}} \frac{\text{217.00}}{\text{217.00}} \frac{\text{215.35}}{\text{225.20}} \frac{\text{225.20}}{\text{257.00}}$	2633.94	(219)
Annual totals kWh/year	kWh/year	
Space heating fuel used, main system 1	8056.15	7
Water heating fuel used	2633.94	Ī
Electricity for pumps, fans and electric keep-hot		
central heating pump:		(230c)
boiler with a fan-assisted flue	=	(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =	84	(231)
Electricity for lighting	435.8	(232)
12a. CO2 emissions – Individual heating systems including micro-CHP	433.0	
Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/yea	
Space heating (main system 1) (211) x 0.216 =	1740.13	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	568.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2309.06	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	43.6	(267)
Electricity for lighting	(232) x	0.519	=	226.18	(268)
Total CO2, kg/year	sum	of (265)(271) =		2578.83	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		22.68	(273)
El rating (section 14)				78	(274)

		User Details:				
Assessor Name:	Su Lee	Stroma Nun	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	ersion:	Versio	n: 1.0.4.16	
	Pro	operty Address: Unit 0	2			
Address :	138-140 Highgate Road, High	ngate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:				\	
Basement		Area(m²) 39.95 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)
Ground floor		35.19 (1b) x	3.2] (2b) = [112.61	(3b)
First floor		32.26 (1c) x	4.65	(2c) =	150.01	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	107.4 (4)				_
Dwelling volume		(3a)+(3	b)+(3c)+(3d)+(3e)+	(3n) =	370.48	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total		m³ per hou	r
Number of chimneys	0 + 0	+ 0 =	0 x	40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x	20 =	0	(6b)
Number of intermittent fa	ns	[5 ×	10 =	50	(7a)
Number of passive vents		[0 ×	10 =	0	(7b)
Number of flueless gas fi	res	[0 x	40 =	0	(7c)
				Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	50	÷ (5) =	0.13	(8)
If a pressurisation test has b	een carried out or is intended, proceed	to (17), otherwise continue	from (9) to (16)			_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration)-1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0	•	truction		0	(11)
if both types of wall are pa deducting areas of openir	resent, use the value corresponding to to nas): if equal user 0.35	he greater wall area (after				
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0			0	(12)
If no draught lobby, en	ter 0.05, else enter 0			İ	0	(13)
Percentage of windows	s and doors draught stripped			İ	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	İ	0	(15)
Infiltration rate		(8) + (10) + (11) + ((12) + (13) + (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope	area	4	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)		İ	0.33	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	/ is being used	L		_
Number of sides sheltere	ed				2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	(19)] =		0.85	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =			0.28	(21)
Infiltration rate modified f	or monthly wind speed					
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	_								<u>!</u>			l	
Adjusted infiltra		<u> </u>				` 	`	`		0.00		İ	
0.36 Calculate effec	0.36 ctive air	0.35 change	0.31 rate for t	0.31 he appli	0.27 Cable ca	0.27 S e	0.26	0.28	0.31	0.32	0.33		
If mechanica		-		upp	J G G G G G G G G G G G G G G G G G G G							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(23b)
If balanced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1	– (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	•								
if (22b)m		<u> </u>	· `	``		· ` `	ŕ	i 	<u> </u>	i e		ı	(0.1.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(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		(24d)
Effective air	change	rate - er	ter (24a) or (24h	o) or (24)	c) or (24	d) in box	(25)	ļ				
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
			•					•					
3 Heat Insses	s and he	at Ince i	naramete	or.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value)	A X k
3. Heat losses		SS	paramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				<)			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	=	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 4.86	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	0.04] = 0.04] =	3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area	SS	Openin	gs	A ,r 2.46 4.86 5.21	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	<)			(26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	<)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44	<) 			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 6	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 4 5 5 6 6 7	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 4 5 6 6 7 e 1	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 1 2 3 4 4 5 5 6 6 7 6 1 7 6 2 6 3	ss (m²)	Openin	gs ₁ ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 4.718 1.582 1.372 5.1935				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 1 2 2 3 3 4 4 5 5 6 6 7 6 1 7 6 2 6 3 5.1	ss (m²)	Openin m	gs ₁ ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95 10.29 0.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935 1.54 0.04				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 1 2 2 3 3 4 4 5 6 6 7 6 1 7 6 2 6 3 10.2 5.1 1.35	ss (m²)	0 4.86	gs ₁ 2	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95 10.29 0.24 -0.05	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 4.718 1.582 1.372 5.1935 1.54 0.04 -0.01				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 1 2 2 3 3 4 4 5 5 6 6 7 6 1 7 6 2 6 3 5.1	ss (m²)	Openin m	gs ₁₂	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95 10.29 0.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935 1.54 0.04				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8	0.15	0.12			(29)
Walls Type7 0.96 0	0.96	0.15	0.14			(29)
Walls Type8 5.63 0	5.63	0.15	0.84			(29)
Walls Type9 4.96 0	4.96	0.15	0.74			(29)
Walls Type10 5.76 4.86	0.9	0.15	0.14			(29)
Walls Type11 0.42 0	0.42	0.15	0.06			(29)
Walls Type12 6.4 0	6.4	0.15 =	0.96			(29)
Walls Type13 9.11 5.29	3.82	0.15 =	0.57			(29)
Walls Type14 1.86 0	1.86	0.15 =	0.28			(29)
Walls Type15 8.6 2.46	6.14	0.15 =	0.92			(29)
Walls Type16 9.3 0	9.3	0.15 =	1.4			(29)
Walls Type17 0.6 0	0.6	0.15 =	0.09		i i	(29)
Walls Type18 8.37 4.86	3.51	0.15 =	0.53		i i	(29)
Roof Type1 31.76 4.5	27.26	0.13 =	3.54		ī	(30)
Roof Type2 3.02 0.98	2.04	0.13 =	0.27		ī Ē	(30)
Total area of elements, m ²	165.72					(31)
Party wall	28.78	× 0 =	0		1	(32)
Party wall	27.84	× 0 =	0		ī 💳	(32)
Party wall	32.1	× 0 =	0		ī 💳	(32)
Party wall	32.96	× 0 =	0		ī 💳	(32)
Party wall	38.6	× 0 =	0		ī Ē	(32)
Party wall	40	× 0 =	0		ī Ē	(32)
* for windows and roof windows, use effective window U ** include the areas on both sides of internal walls and p		ng formula 1/[(1/U-va	lue)+0.04] as given i	n paragraph 3	3.2	
Fabric heat loss, W/K = S (A x U)	artiions	(26)(30) + (32) =	:	Г	70.34	(33)
Heat capacity Cm = S(A x k)		((28))(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indic	cative Value: Medium	, <u> </u>	250	(35)
For design assessments where the details of the constru	ıction are not known	precisely the indicati	ve values of TMP in	Table 1f		
can be used instead of a detailed calculation.	A			_		–
Thermal bridges: $S(L \times Y)$ calculated using N if details of thermal bridging are not known (36) = 0.15 \times	• •			L	15.84	(36)
Total fabric heat loss	(31)	(33)	+ (36) =	Γ	86.18	(37)
Ventilation heat loss calculated monthly		(38)	$m = 0.33 \times (25) m \times (80)$	5)		_
Jan Feb Mar Apr Ma	y Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 69.19 68.87 68.57 67.13 66.86	65.6 65.6	65.37 66.08	66.86 67.4	67.97		(38)
Heat transfer coefficient, W/K		(39)	m = (37) + (38)m			
(39)m= 155.37 155.06 154.75 153.31 153.0-	4 151.79 151.79	9 151.55 152.27	153.04 153.58	154.15		_
Heat loss parameter (HLP), W/m²K		(40)	Average = Sum(39) $m = (39)m \div (4)$)112 /12=	153.31	(39)
(40)m= 1.45 1.44 1.44 1.43 1.42	1.41 1.41	1.41 1.42	1.42 1.43	1.44		
Number of days in month /Table 1a)			Average = Sum(40))112 /12=	1.43	(40)
Number of days in month (Table 1a) Jan Feb Mar Apr Mar	y Jun Jul	Aug Sep	Oct Nov	Dec		
L adit 1 ep Ividi Api Ivid	<u>, </u>	I Aug I Sep	1 001 1100	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 occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.8		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the c	lwelling is	designed i			se target of		0.66		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								ССР	001	1101			
(44)m= 110.73	106.7	102.67	98.65	94.62	90.59	90.59	94.62	98.65	102.67	106.7	110.73		
_									Total = Sur	. ,		1207.91	(44)
Energy content of													
(45)m= 164.2	143.61	148.2	129.2	123.97	106.98	99.13	113.75	115.11	134.15	146.44	159.02	1583.76	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Total = Sur	11(45)112 =	-	1363.76	
(46)m= 24.63	21.54	22.23	19.38	18.6	16.05	14.87	17.06	17.27	20.12	21.97	23.85		(46)
Water storage								•					
Storage volum	` '		•			_		ame ves	sel		210		(47)
If community hotherwise if no	•			_			, ,	are) ante	or 'O' in (47)			
Water storage		not wate	ei (iiii5 ii	iciuues i	HStaritai	ieous cc	ווטט וטווות	ers) erite	ei 0 iii (•	+1)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	57		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	85		(50)
b) If manufactHot water stor			-										(54)
If community h	-			ez (KVV	II/IIII C /Ua	iy <i>)</i>					0		(51)
Volume factor	•										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	om wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	85		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)ı	m				
(56)m= 26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(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 (I	H11) is fro	m Append	ix H	
(57)m= 26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(57)
Primary circuit	t loss (ar	nnual) fro	om Table	3							0		(58)
Primary circuit					•	. ,	, ,						
(modified by	1	1		ı —									(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 ca	1	1	r	` 	`	· ` `							
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
<u>-</u>			~~				`		` 	<u> </u>	ri de la composição de la composição de la composição de la composição de la composição de la composição de la	(59)m + (61)m	
(62)m= 213.75	188.36	197.74	177.15	173.51	154.92	148.67	163.3	163.06	183.7	194.38	208.57		(62)

Solar DHW input calcula	ted using App	oendix G o	r Appendix	H (nega	tive quantity	y) (ent	ter '0' i	f no solar	contrib	ution to wate	er heating))	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m = 0 0	0	0	0	0	0	(0	0	0	0		(63)
Output from water I	neater												
(64)m= 213.75 188.	36 197.74	177.15	173.51	154.92	148.67	163	3.3	163.06	183.7	194.38	208.57		
				-			Outpu	it from wa	ter hea	ter (annual) ₁	12	2167.11	(64)
Heat gains from wa	ter heating	, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	+ (6	31)m]	+ 0.8 x	[(46)r	n + (57)m	+ (59)m	n]	
(65)m= 94.23 83.5	55 88.91	81.32	80.86	73.93	72.6	77.	.46	76.63	84.24	87.05	92.51		(65)
include (57)m in	calculation	of (65)m	only if c	ylinder	is in the	dwell	ling o	r hot wa	ater is	from com	munity h	neating	
5. Internal gains (see Table	5 and 5a	ı):										
Metabolic gains (Ta	ıble 5), Wa	tts											
Jan Fe		Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 139.91 139.	91 139.91	139.91	139.91	139.91	139.91	139	.91	139.91	139.91	139.91	139.91	1	(66)
Lighting gains (calc	ulated in A	ppendix	L, equat	ion L9	or L9a), a	lso s	see Ta	able 5		•		-	
(67)m= 23.87 21.	2 17.24	13.05	9.76	8.24	8.9	11.	.57	15.53	19.72	23.02	24.54]	(67)
Appliances gains (d	alculated i	n Appen	dix L, eq	uation	L13 or L1	За),	also	see Tab	le 5	•		•	
(68)m= 267.77 270	54 263.54	248.64	229.82	212.14	200.32	197	'.54	204.54	219.45	238.27	255.95]	(68)
Cooking gains (cald	ulated in A	ppendix	L, equa	tion L1	or L15a), als	o see	e Table	5	•		4	
(69)m= 36.99 36.9	9 36.99	36.99	36.99	36.99	36.99	36.	.99	36.99	36.99	36.99	36.99]	(69)
Pumps and fans ga	ins (Table	5a)			_!					_!		_	
(70)m= 3 3	<u>`</u>	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. evapor	ation (nega	ative valu	ies) (Tab	le 5)	- !	•						4	
(71)m= -111.93 -111			-111.93	-111.93	-111.93	-111	1.93 -	-111.93	-111.93	3 -111.93	-111.93	1	(71)
Water heating gain	s (Table 5)	•	1	•	•					•		-	
(72)m= 126.66 124	33 119.5	112.94	108.68	102.68	97.58	104	.11	106.43	113.23	3 120.9	124.34]	(72)
Total internal gain	s =	•	•	(6	6)m + (67)n	n + (68	8)m + ((69)m + (7	70)m +	(71)m + (72)	m	_	
(73)m= 486.27 484.	05 468.26	442.6	416.23	391.02	374.77	38′	1.2	394.48	420.37	450.15	472.8]	(73)
6. Solar gains:										•			
Solar gains are calcula	ted using sola	ar flux from	Table 6a	and asso	ciated equa	ations	to con	vert to the	applic	able orientat	ion.		
Orientation: Acces		Area	l		ux			g_ -		FF		Gains	
Table	6d	m²		l i	able 6a		Ιa	ble 6b		Table 6c		(W)	
Northeast _{0.9x}	.77 ×	5.:	29	x	11.28	X		0.76	x	0.7	=	22.01	(75)
Northeast 0.9x	.77 ×	5.:	29	x	11.28	X		0.76	x	0.7	=	22.01	(75)
Northeast 0.9x	.77 ×	5.3	29	x	22.97	x		0.76	x	0.7	=	44.79	(75)
Northeast 0.9x	.77 ×	5.:	29	x	22.97	X		0.76	x	0.7	=	44.79	(75)
Northeast 0.9x	.77 ×	5.3	29	x	41.38	X		0.76	x	0.7	=	80.7	(75)
Northeast 0.9x	.77 ×	5.3	29	x	41.38	x		0.76	x	0.7	=	80.7	(75)
Northeast 0.9x	.77 ×	5.3	29	x	67.96	x		0.76	x	0.7	=	132.53	(75)
Northeast 0.9x	.77 ×	5.:	29	x	67.96	x		0.76	x	0.7	=	132.53	(75)
Northeast _{0.9x}	.77 ×	5.3	29	x	91.35	x		0.76	x	0.7	=	178.15	(75)
Northeast _{0.9x}	.77 ×	5.:	29	x	91.35	x		0.76	X	0.7	=	178.15	(75)
													

Northeast _{0.9x}	0.77] x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]]	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] x	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7] =	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7	<u> </u>	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Roulights 0.9s 1	Rooflights	0.0v	4	-	0.00	- ,	. —	00	1 , 1	0.70	_	0.7	-	45.05	(82)
Rooflights 0.3x		<u> </u>	1	×	0.98	=		96	X]	0.76	× [0.7	_ =	45.05	= ' '
Rooflights 0.3x				=		=]		╡╏		=		=
Rooflights 0.3x				=		=]		╡		=		=
Rooflights 0.3x			1	X	0.98	⊣ ′		150	X	0.76	×	0.7	=	70.38	= ' '
Rooflights 0.9x		<u> </u>	1	X	3.37	×	·	192	X	0.76	×	0.7	=	309.8	(82)
Rooflights 0.9x			1	X	1.13	×		192	X	0.76	X	0.7	=	103.88	(82)
Rooflights 0.9x			1	X	0.98	×		192	X	0.76	X	0.7	=	90.09	(82)
Rooflights 0.9x		<u> </u>	1	X	3.37	×	:	200	X	0.76	X	0.7	=	322.71	(82)
Rooflights 0.9x	Rooflights	0.9x	1	X	1.13	Х		200	X	0.76	X	0.7	=	108.21	(82)
Rooflights 0.9x	Rooflights	0.9x	1	X	0.98	×	(200	x	0.76	X	0.7	=	93.84	(82)
Rooflights 0.9x	Rooflights	0.9x	1	X	3.37	х		189	x	0.76	x	0.7	=	304.96	(82)
Rooflights 0.9x	Rooflights	0.9x	1	X	1.13	×	(189	x	0.76	x	0.7	=	102.26	(82)
Rooflights 0.9x	Rooflights	0.9x	1	x	0.98	x		189	x	0.76	x	0.7		88.68	(82)
Rooflights 0.9x	Rooflights	0.9x	1	x	3.37	×		157	x	0.76	x	0.7		253.33	(82)
Rooflights 0.9x	Rooflights	0.9x	1	x	1.13	×		157	x	0.76	×	0.7		84.94	(82)
Rooflights 0.9x	Rooflights	0.9x	1	x	0.98	= ×		157	X	0.76	= x	0.7	-	73.67	(82)
Rooflights 0.9x	Rooflights	0.9x	1	x	3.37	= ,		115	X	0.76	×	0.7	= =	185.56	(82)
Rooflights 0.9x	Rooflights	0.9x	1	×		\dashv ,] x		×	0.7		62.22	(82)
Rooflights 0.9x		<u> </u>		$=$ $_{x}$		=			」] _x :		_		= =		= ' '
Rooflights 0.9x				=		=	-]		╡╏		=		╡` ′
Rooflights 0.9x				=		=]		╡╏		=		=
Rooflights 0.9x				=		=]		≓ ¦		=		= ` `
Rooflights 0.9x				=		=	-]		╡		=		= '
Rooflights 0.9x				=		=]		╡		=		= ` `
Rooflights 0.9x		<u> </u>		=		=]		╡		=		= ` `
Rooflights 0.9x				=		=	-]		╡╏		=		= ` `
Rooflights 0.9x				=		=			J !		╡		=		=
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 386.5 700.4 1060.31 1468.94 1775.54 1816.92 1729.37 1494.36 1201.89 802.52 470.83 325.54 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 872.77 1184.45 1528.57 1911.54 2191.77 2207.94 2104.14 1875.55 1596.37 1222.89 920.99 798.34 (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 = 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)				=		=]		≓ ¦		=		= ' '
(83)m= 386.5 700.4 1060.31 1468.94 1775.54 1816.92 1729.37 1494.36 1201.89 802.52 470.83 325.54 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 872.77 1184.45 1528.57 1911.54 2191.77 2207.94 2104.14 1875.55 1596.37 1222.89 920.99 798.34 (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= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Rooflights	0.9x	1	X	0.98	×		21	X	0.76	X	0.7	=	9.85	(82)
(83)m= 386.5 700.4 1060.31 1468.94 1775.54 1816.92 1729.37 1494.36 1201.89 802.52 470.83 325.54 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 872.77 1184.45 1528.57 1911.54 2191.77 2207.94 2104.14 1875.55 1596.37 1222.89 920.99 798.34 (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= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 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= 872.77 1184.45 1528.57 1911.54 2191.77 2207.94 2104.14 1875.55 1596.37 1222.89 920.99 798.34 (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= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	— —				-		4040.00	4700.07				170.00	205.54	7	(92)
(84)m= 872.77 1184.45 1528.57 1911.54 2191.77 2207.94 2104.14 1875.55 1596.37 1222.89 920.99 798.34 (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= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)									1494	1.36 1201.89	802.52	470.83	325.54		(03)
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= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)					` 		` '		1075	55 1506 27	1222.9	2 020 00	709 24	1	(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= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)			!_				2207.94	2104.14	1075	0.00 1090.07	1222.0	9 920.99	790.34		(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 (86)m= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)				,											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Tempera	ature du	ing hea	ating pe	eriods in the	e livin	g area t	rom Tal	ble 9,	Th1 (°C)				21	(85)
(86)m= 0.99 0.98 0.93 0.8 0.61 0.43 0.32 0.37 0.62 0.9 0.98 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisatio			s for li			`	ble 9a)	_			_		7	
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	<u> </u>	Jan I	-eb	Mar	Apr N	Лау	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
	(86)m = 0	0.99	.98	0.93	0.8 0.	.61	0.43	0.32	0.3	7 0.62	0.9	0.98	1		(86)
(87)m= 19.57 19.89 20.31 20.72 20.93 20.99 21 20.99 20.94 20.59 19.98 19.51 (87)	Mean inf	ternal te	mperatu	ıre in li	ving area 1	1 (fol	low ste	ps 3 to 7	7 in T	able 9c)					
	(87)m= 1	9.57 19	9.89 2	20.31	20.72 20	0.93	20.99	21	20.9	20.94	20.59	19.98	19.51		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	Tempera	ature du	ing hea	ating pe	eriods in re	st of c	lwellina	from Ta	able 9), Th2 (°C)				=	
(88)m= 20.28 20.28 20.28 20.29 20.29 20.29 20.29 20.29 20.29 20.29 20.29 20.28 20.28 (88)	· · · · ·		<u> </u>						_		20.29	20.28	20.28		(88)
					1							<u> </u>	!	- 1	

Utilisation factor for gains for rest of dwelling, h2,m (see Table 98) Mean internal temperature in the rest of dwelling 12 (follow steps 3 to 7 in Table 9c)	Utilisation fact	or for a	ains for i	est of du	wellina h	n2 m (se	e Table	9a)						
18.94 19.26 19.67 20.06 20.23 20.29 20.28 20.29 20.25 19.95 19.35 18.88 (90)				i			1		0.56	0.88	0.98	0.99		(89)
18.94 19.26 19.67 20.06 20.23 20.29 20.28 20.29 20.25 19.95 19.35 18.88 (90)	Mean internal	temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	in Tabl	e 9c)	<u> </u>	<u> </u>		
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2					i	<u> </u>		·			19.35	18.88		(90)
(92)m= 19.14 19.46 19.88 20.28 20.46 20.52 20.52 20.52 20.52 20.48 20.16 19.56 19.09 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.74 20.06 20.48 20.88 21.06 21.12 21.12 21.12 21.12 21.08 20.76 20.16 19.69 (93) Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.97 0.92 0.79 0.61 0.44 0.32 0.38 0.62 0.89 0.98 0.99 0.99 Useful gains, hmGm, W = (94)m x (84)m (95)m= 864.79 1150.64 1404.49 1515.24 1341.33 971.05 682.72 708.5 991.92 1091.5 902.25 793.13 (95) Monthly average external temperature, Lm , W = ((39)m x ((93)m x ((LL				!		l .		f	LA = Livin	g area ÷ (4	4) =	0.33	(91)
(92)m= 19.14 19.46 19.88 20.28 20.46 20.52 20.52 20.52 20.52 20.48 20.16 19.56 19.09 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.74 20.06 20.48 20.88 21.06 21.12 21.12 21.12 21.12 21.08 20.76 20.16 19.69 (93) Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.97 0.92 0.79 0.61 0.44 0.32 0.38 0.62 0.89 0.98 0.99 0.99 Useful gains, hmGm, W = (94)m x (84)m (95)m= 864.79 1150.64 1404.49 1515.24 1341.33 971.05 682.72 708.5 991.92 1091.5 902.25 793.13 (95) Monthly average external temperature, Lm , W = ((39)m x ((93)m x ((Mean internal	temper:	ature (fo	r the wh	ole dwel	ling) – fl	Δ ν Τ1	+ (1 – fl	Δ) v T2			ľ		_
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)ms 19.74 20.06 20.48 20.88 21.06 21.12 21.12 21.12 21.08 20.76 20.16 19.69 (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)ms 0.99 0.97 0.92 0.79 0.61 0.44 0.32 0.38 0.62 0.89 0.98 0.99 0.99 (94) Useful gains, hmGm , W = (94)m x (84)m (95)ms 864.79 1150.64 1404.49 1515.24 1341.33 971.05 682.72 708.5 991.92 1091.5 902.25 793.13 (95) Monthly average external temperature from Table 8 (96)ms 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 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) x (293)m x (293			<u> </u>	1	1					20.16	19.56	19.09		(92)
19,74 20,06 20,48 20,88 21,06 21,12 21,12 21,12 21,08 20,76 20,16 19,69 (93) 3. Space heating requirement		ent to th	ne mean	internal	tempera	ature fro	m Table	4e, whe	re appro	L opriate		<u> </u>		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.97 0.92 0.79 0.61 0.44 0.32 0.38 0.62 0.89 0.98 0.99 0.99 (94) Useful gains, hmGm , W = (94)m x (84)m (95)m= 864.79 1150.64 1404.49 1515.24 1341.33 971.05 682.72 708.5 991.92 1091.5 902.25 793.13 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = (39)m x (93)m - (96)m 1 (97)m= 2399.28 2351.09 2163.62 1836.27 1432.59 988.9 1 886.58 715.7 1062.93 1554.62 2005.31 2387.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 0 344.56 794.2 1186.11 Total per year (kWh/year) = Sum(98)s = 5137.06 (98) Space heating: Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating systems including micro-CHP) Space heating requirements — hadividual heating systems in [204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	· · · · · · · · · · · · · · · · · · · 									·	20.16	19.69		(93)
The utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Space heati	ing requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
94 94 99 0.97 0.92 0.79 0.61 0.44 0.32 0.38 0.62 0.89 0.98 0.99 (94) Useful gains, hmGm , W = (94)m x (84)m (95)m = 864.79 1150.64 1404.49 1515.24 1341.33 971.05 682.72 708.5 991.92 1091.5 902.25 793.13 (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 = 2399.28 2351.09 2163.62 1836.27 1432.59 988.91 686.58 715.7 1062.93 1554.62 2005.31 2387.36 (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 Total per year (kWh/year) = Sum(98)a						Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m	Utilisation fact	or for g	ains, hm	:										
96 me	(94)m= 0.99	0.97	0.92	0.79	0.61	0.44	0.32	0.38	0.62	0.89	0.98	0.99		(94)
Monthly average external temperature from Table 8 (96)m=	Useful gains, h	nmGm ,	W = (94	1)m x (84	1)m									
96 m=	(95)m= 864.79	1150.64	1404.49	1515.24	1341.33	971.05	682.72	708.5	991.92	1091.5	902.25	793.13		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = 2399.28 2351.09 2163.62 1432.59 988.91 686.58 715.7 1062.93 1554.62 2005.31 2387.36 (97) (98)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 (98)m = 1141.66 806.7 1432.59 88.91 686.58 715.7 1062.93 1554.62 2005.31 2387.36 (97) (98)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 (98)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 0 344.56 794.2 1186.11 (98)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 0 344.56 794.2 1186.11 (98)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 (97)m = 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 (97)m = 1141.61 (97)m = 1141												<u> </u>		
(97)m= 2399.28 2351.09 2163.62 1836.27 1432.59 988.91 686.58 715.7 1062.93 1554.62 2005.31 2387.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 Total per year (kWh/year) = Sum(98)											7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 Total per year (kWh/year) = Sum(98) _{1.38-12} = 5137.06 (98) Space heating requirement in kWh/m²/year 47.83 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 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) [1141.66 806.7 564.79 231.14 67.9 0 0 0 0 0 344.56 794.2 1186.11]							- ` 		<u> </u>		0005.04	0007.00		(07)
(98)m= 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11 Total per year (kWh/year) = Sum(98)912 = 5137.06 (98) Space heating requirement in kWh/m²/year 47.83 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11	` '						l .			l .	l .	2387.36		(97)
Total per year (kWh/year) = Sum(98) _{1.59-12} = 5137.06 (98)	· —				i					 	·	1186 11		
Space heating requirement in kWh/m²/year 47.83 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204) Efficiency of main space heating system 1 85.4 (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) 1141.66 806.7 564.79 231.14 67.9 0 0 0 344.56 794.2 1186.11	(50)1112 [1141.55]	000.7	004.70	201.14	07.0	Ū	Ů				<u> </u>	L	5137.06	7(98)
Space heating: Fraction of space heat from secondary/supplementary system Fraction of total heating from main system (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11	Space heating	ı require	ement in	kWh/m²	/vear			Tota	i poi youi	(KVVIII y Cal) = Gu iii(3	O)15,912 —		╡``
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 85.4 (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) 1141.66 806.7 564.79 231.14 67.9 0 0 0 344.56 794.2 1186.11		•				retome i	neludina	micro C	·UD/					」 ` ′
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11			its – Iriui	vidual III	ealing sy	/Sterris i	riciuuliig	IIIICIO-C	, i ir)					
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204) Efficiency of main space heating system 1 85.4 (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) 1141.66 806.7 564.79 231.14 67.9 0 0 0 0 344.56 794.2 1186.11	•	_	t from se	econdary	//supple	mentary	system					I	0	(201)
Fraction of total heating from main system 1	Fraction of spa	ace hea	t from m	ain syst	em(s)	·	•	(202) = 1 -	- (201) =				1	(202)
Efficiency of main space heating system 1	•			-	` '			(204) = (20	02) × [1 –	(203)] =			1	╡`
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year			•	-										╡`
Space heating requirement (calculated above) 1141.66 806.7 564.79 231.14 67.9 0 0 0 344.56 794.2 1186.11	-	-		•		g system	າ, %						0	(208)
Space heating requirement (calculated above) 1141.66 806.7 564.79 231.14 67.9 0 0 0 344.56 794.2 1186.11	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
	Space heating	require	ement (c		d above)								·	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211)	1141.66	806.7	564.79	231.14	67.9	0	0	0	0	344.56	794.2	1186.11		
	(211) m = {[(98)]	m x (20	4)] } x 1	00 ÷ (20	6)									(211)
1336.84 944.61 661.34 270.66 79.51 0 0 0 403.47 929.98 1388.88	1336.84	944.61	661.34	270.66	79.51	0	0	0	0	403.47	929.98	1388.88		
Total (kWh/year) = Sum(211) _{15,1012} 6015.29 (211)							•	Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	F	6015.29	(211)
Space heating fuel (secondary), kWh/month	Space heating	fuel (se	econdar	y), kWh/i	month									
$= \{[(98)m \times (201)]\} \times 100 \div (208)$	= {[(98)m x (20)	1)] } x 1	00 ÷ (20	8)										
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	(215)m= 0	0	0	0	0	0	0		_					_
Total (kWh/year) =Sum(215) $_{15,1012}$ = 0 (215)								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)

Water heating								
Output from water heater (calculated above) 213.75 188.36 197.74 177.15 173.51 1	54.92 148.67	163.3	163.06	183.7	194.38	208.57]	
Efficiency of water heater	!						75.3	(216)
(217)m= 87.63 87.09 85.93 83.16 79.01	75.3 75.3	75.3	75.3	84.51	86.97	87.77		(217)
Fuel for water heating, kWh/month	-						•	
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 243.92 216.27 230.11 213.01 219.61 2	205.74 197.44	216.86	216.54	217.37	223.5	237.63]	
			I = Sum(2				2638.02	(219)
Annual totals				k\	Wh/year	•	kWh/year	_ _
Space heating fuel used, main system 1							6015.29	
Water heating fuel used							2638.02	
Electricity for pumps, fans and electric keep-hot								_
central heating pump:						39]	(230c)
boiler with a fan-assisted flue						45	j	(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			84	(231)
Electricity for lighting							421.58	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy kWh/year			Emiss	ion fac	tor	Emissions	
	KVVII/yeai			kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(211) x			kg CO		=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	•				16	=		_
, , ,	(211) x			0.2	16		1299.3	(261)
Space heating (secondary)	(211) x (215) x	+ (263) + (264) =	0.2	16	=	1299.3	(261)
Space heating (secondary) Water heating	(211) x (215) x (219) x	+ (263) + (:	264) =	0.2	16 19	=	1299.3 0 569.81	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262)	+ (263) + (:	264) =	0.2	16 19 16	=	1299.3 0 569.81 1869.12	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) (231) x	+ (263) + (:		0.2	16 19 16 19	=	1299.3 0 569.81 1869.12 43.6	(261) (263) (264) (265) (267)

El rating (section 14)

(274)

		Us	er Details:					
Assessor Name:	Su Lee		Strom	a Num	ber:	STRO	031315	
Software Name:	Stroma FSAP 201	2	Softw	are Ve	rsion:	Versio	n: 1.0.4.16	
			erty Address					
Address :	138-140 Highgate R	oad, Highga	ate, Highgat	e, NW5 ′	1PB			
Overall dwelling dime	nsions:		A (2)		Ass Hadalat	()	Malara a (a. 2	
Basement		ſ	40.51	(1a) x	Av. Height	(m) (2a) =	Volume(m³	(3a)
Ground floor		Γ	35.41	(1b) x	3.2	(2b) =	113.31	(3b)
First floor		Ī	32.25	(1c) x	4.65	(2c) =	149.96	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	108.17	(4)				
Dwelling volume		_		(3a)+(3b)+(3c)+(3d)+(3e	e)+(3n) =	372.65	(5)
2. Ventilation rate:								
		econdary eating	other		total		m³ per hou	.r
Number of chimneys	0 +	0 +	0	_ = [0	x 40 =	0	(6a)
Number of open flues	0 +	0	0	_ = [0	x 20 =	0	(6b)
Number of intermittent fa	ns				5	x 10 =	50	(7a)
Number of passive vents					0	x 10 =	0	(7b)
Number of flueless gas fi	res				0	x 40 =	0	(7c)
						Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6	a)+(6b)+(7a)+(7	7b)+(7c) =	Γ	50	÷ (5) =	0.13	(8)
If a pressurisation test has b	een carried out or is intende	d, proceed to (17), otherwise	continue fr	rom (9) to (16)	L		
Number of storeys in the	ne dwelling (ns)						0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0				•	ruction		0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value correspons): if equal user 0.35	oonding to the	greater wall are	ea (after				
If suspended wooden f	= :	ed) or 0.1 (s	ealed), else	enter 0		[0	(12)
If no draught lobby, en	ter 0.05, else enter 0						0	(13)
Percentage of windows	s and doors draught st	ripped				Ī	0	(14)
Window infiltration	_		0.25 - [0.3	2 x (14) ÷ 1	100] =	ĺ	0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) + (15)	=	0	(16)
Air permeability value,	q50, expressed in cub	ic metres pe	er hour per s	quare m	etre of envel	ope area	4	(17)
If based on air permeabil	ity value, then (18) = [(1	7) ÷ 20]+(8), ot	herwise (18) =	(16)		Ì	0.33	(18)
Air permeability value applie	s if a pressurisation test has	been done or	a degree air pe	ermeability	is being used	ı		_
Number of sides sheltere	d						2	(19)
Shelter factor			(20) = 1 -	[0.075 x (²	19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18	3) x (20) =		[0.28	(21)
Infiltration rate modified f	or monthly wind speed							
Jan Feb	Mar Apr May	Jun J	ul Aug	Sep	Oct N	lov Dec		
Monthly average wind sp	eed from Table 7							

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (22	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>	<u> </u>			
Adjusted infiltra		`				` 	r `	ì ´	I 0.04				
0.36 Calculate effect	0.36 tive air (0.35 Change	0.31 rate for t	0.31 he appli	0.27 cable ca	0.27 S e	0.26	0.28	0.31	0.32	0.33		
If mechanical		-			- C.I.O. T. G. G.							0	(23a)
If exhaust air hea	at pump ι	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(23b)
If balanced with I	heat reco	very: effic	iency in %	allowing for	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balanced	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	I – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		· ,	<u> </u>		<u> </u>	· ` `	ŕ		· ` ·				(0.1.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v									0.51				
(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		(24d)
Effective air o						<u> </u>	<u> </u>						
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
3 Heat losses	and he	at loss r	naramete	ar.									
3. Heat losses ELEMENT	Gros	ss	Openin	gs	Net Ar		U-valı W/m2		A X U	<)	k-value		A X k
ELEMENT		ss		gs	A ,r	n²	W/m2	k 	(W/I	<) 	k-value kJ/m²-ł		kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m² x	W/m2 1.4	2K =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area	ss	Openin	gs	A ,r 2.46 4.86	m ² x x x 1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] =	(W/I 3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1	ss	Openin	gs	A ,r 2.46 4.86 5.21	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	<) 			(26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86 6.44	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 2 1 2 2	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 2 1 2 2	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 9 1 9 2 9 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 2 1 2 2	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 9 1 9 2 9 3	es (m²)	Openin	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663				(26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	9 3	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663 1.54				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (29) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	9 3	Openin m	gs 2	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51 10.29 0.22	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663 1.54 0.03				(26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8	0.15 =	0.12			(29)
Walls Type7 0.96 0	0.96	0.15 =	0.14			(29)
Walls Type8 6.02 0	6.02	0.15	0.9			(29)
Walls Type9 4.96 0	4.96	0.15	0.74			(29)
Walls Type10 5.76 4.86	0.9	0.15	0.14			(29)
Walls Type11 0.42 0	0.42	0.15	0.06			(29)
Walls Type12 6.4 0	6.4	0.15	0.96			(29)
Walls Type13 9.11 5.29	3.82	0.15	0.57			(29)
Walls Type14 1.86 0	1.86	0.15	0.28			(29)
Walls Type15 8.6 2.46	6.14	0.15	0.92			(29)
Walls Type16 9.3 0	9.3	0.15	1.4			(29)
Walls Type17 0.6 0	0.6	0.15	0.09			(29)
Walls Type18 8.37 4.86	3.51	0.15	0.53			(29)
Roof Type1 31.76 4.5	27.26	0.13 =	3.54			(30)
Roof Type2 3.31 0.98	2.33	0.13 =	0.3			(30)
Total area of elements, m ²	166.94					(31)
Party wall	29.24	0 =	0			(32)
Party wall	28.24	0 =	0			(32)
Party wall	32.58	0 =	0			(32)
Party wall	33.47	0 =	0			(32)
Party wall	38.73	0 =	0			(32)
Party wall	40	0 =	0			(32)
* for windows and roof windows, use effective window ** include the areas on both sides of internal walls and		ng formula 1/[(1/U-val	ue)+0.04] as given ir	n paragraph :	3.2	
Fabric heat loss, $W/K = S (A \times U)$,	(26)(30) + (32) =		Г	70.51	(33)
Heat capacity Cm = S(A x k)		((28)	(30) + (32) + (32a)	(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA	a) in kJ/m²K	Indica	ative Value: Medium	Ī	250	(35)
For design assessments where the details of the const	ruction are not known	precisely the indicativ	e values of TMP in T	able 1f		
can be used instead of a detailed calculation. Thermal bridges: S(L x Y) calculated using	Annendiy K			г	45.0	(36)
if details of thermal bridging are not known (36) = 0.15	• •			L	15.9	(30)
Total fabric heat loss	, ,	(33) -	+ (36) =		86.41	(37)
Ventilation heat loss calculated monthly		(38)n	$n = 0.33 \times (25) \text{m} \times (5)$	5)		
 	ay Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 69.55 69.24 68.93 67.49 67.2	22 65.96 65.96	65.73 66.45	67.22 67.77	68.34		(38)
Heat transfer coefficient, W/K		(39)n	n = (37) + (38)m			
(39)m= 155.96 155.65 155.34 153.9 153.	63 152.37 152.37	7 152.14 152.86	153.63 154.17	154.74		-
Heat loss parameter (HLP), W/m²K		(40)n	Average = Sum(39) $n = (39)m \div (4)$	112 /12=	153.9	(39)
(40)m= 1.44 1.44 1.42 1.4	2 1.41 1.41	1.41 1.41	1.42 1.43	1.43		
Number of days in month (Table 1a)	<u>, </u>		Average = Sum(40)	112 /12=	1.42	(40)
	ay Jun Jul	Aug Sep	Oct Nov	Dec		
	· 1 1 ·	<u>, </u>	1			

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•												
4. Water he	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occif TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		.8		(42)
Annual avera Reduce the ann not more that 12	ige hot wa ual average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		0.78		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•					
(44)m= 110.86	106.83	102.8	98.76	94.73	90.7	90.7	94.73	98.76	102.8	106.83	110.86		٦
Energy content	of hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600		Total = Sui oth (see Ta	. ,		1209.36	(44)
(45)m= 164.4	143.79	148.37	129.36	124.12	107.11	99.25	113.89	115.25	134.31	146.61	159.21		
If instantaneous	water heat	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1585.67	(45)
(46)m= 24.66	21.57	22.26	19.4	18.62	16.07	14.89	17.08	17.29	20.15	21.99	23.88		(46)
Water storag		\	Į.					!		!	Į.		
Storage volu	•	,	•			_		ame ves	sel		210		(47)
If community Otherwise if	•			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storag			. (0.0, 0		,			
a) If manufa	cturer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	57		(48)
Temperature	factor fro	m Table	2b							0.	54		(49)
Energy lost f		•			or io not		(48) x (49)) =		0.	85		(50)
b) If manufaHot water sto			-								0		(51)
If community	heating s	see secti	on 4.3										
Volume factor											0		(52)
Temperature											0		(53)
Energy lost f		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Enter (50) of	. , .	•	for oooh	month			//E6\m - /	'EE\ ~ (41\)	~	0.	85		(55)
Water storag					05.40		1	(55) × (41)		05.40	20.20		(56)
(56)m= 26.28 If cylinder contains		26.28 ed solar sto	25.43 rage, (57)	26.28 m = (56)m	25.43 x [(50) – (26.28 H11)] ÷ (5	26.28 0), else (5	25.43 7)m = (56)	26.28 m where (25.43 H11) is fro	26.28 m Append	ix H	(30)
(57)m= 26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(57)
Primary circu	it loss (ar	nnual) fro	ı——— ım Table	- 3	<u> </u>	<u> </u>	!	!	<u> </u>		0		(58)
Primary circu	,	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss c	alculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	quired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 213.94	188.53	197.92	177.3	173.66	155.05	148.79	163.43	163.2	183.86	194.56	208.76		(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 213.94 188.53 197.92 177.3 173.66 155.05 148.79 163.43 163.2 183.86 194.56 208.76	
Output from water heater (annual) ₁₁₂	2169.01 (64)
Heat gains from water heating, kWh/month $0.25 (0.85 \times (45)) + (61) = 0.8 \times (46) + (57) + (59) = 0.8 \times (45) $	
(65)m= 94.3 83.61 88.97 81.37 80.91 73.97 72.64 77.5 76.68 84.29 87.11 92.57	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community he	eating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17 140.17	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 23.97 21.29 17.32 13.11 9.8 8.27 8.94 11.62 15.6 19.8 23.11 24.64	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 268.9 271.69 264.66 249.69 230.79 213.03 201.17 198.38 205.41 220.38 239.28 257.04	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02 37.02	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14 -112.14	(71)
Water heating gains (Table 5)	
(72)m= 126.75 124.42 119.58 113.01 108.74 102.74 97.63 104.17 106.5 113.3 120.98 124.43	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 487.67 485.45 469.61 443.86 417.39 392.09 375.79 382.22 395.55 421.53 451.42 474.15	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF	Gains
Table 6d m ² Table 6a Table 6b Table 6c	(W)
Northeast 0.9x 0.77 x 5.29 x 11.28 x 0.76 x 0.7 =	22.01 (75)
Northeast 0.9x 0.77 x 5.29 x 11.28 x 0.76 x 0.7 =	22.01 (75)
Northeast 0.9x 0.77 x 5.29 x 22.97 x 0.76 x 0.7 =	44.79 (75)
Northeast 0.9x 0.77 x 5.29 x 22.97 x 0.76 x 0.7 =	44.79 (75)
Northeast 0.9x 0.77 x 5.29 x 41.38 x 0.76 x 0.7 =	80.7 (75)
Northeast 0.9x 0.77 x 5.29 x 41.38 x 0.76 x 0.7 =	80.7 (75)
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 =	132.53 (75)
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 =	132.53 (75)
Northeast 0.9x 0.77 x 5.29 x 91.35 x 0.76 x 0.7 =	178.15 (75)
Northeast 0.9x 0.77 x 5.29 x 91.35 x 0.76 x 0.7 =	178.15 (75)

Northeast _{0.9x}	0.77] x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]] _x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] x	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7	=	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7	<u> </u>	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Rooflights 0.9x	1	х	0.98		х	96	x [0.76	x	0.7	=	45.05	(82)
Rooflights _{0.9x}	1	X	3.37		X	150	i x	0.76	×	0.7	=	242.03	(82)
Rooflights _{0.9x}	1	X	1.13		X	150	×	0.76	x	0.7		81.16	(82)
Rooflights _{0.9x}	1	X	0.98		X	150	i x	0.76	×	0.7		70.38	(82)
Rooflights 0.9x	1	x	3.37		х	192	i x	0.76	×	0.7	_ =	309.8	(82)
Rooflights 0.9x	1	X	1.13		х	192] x [0.76	x	0.7	╡ -	103.88	(82)
Rooflights 0.9x	1	X	0.98		х	192	וֹ × וֹ	0.76	×	0.7		90.09	(82)
Rooflights _{0.9x}	1	X	3.37		х	200	i ×	0.76	×	0.7	_ =	322.71	(82)
Rooflights _{0.9x}	1	X	1.13		X	200	×	0.76	x	0.7		108.21	(82)
Rooflights 0.9x	1	X	0.98		х	200	וֹ × וֹ	0.76	×	0.7		93.84	(82)
Rooflights _{0.9x}	1	X	3.37		х	189	i x	0.76	×	0.7	_ =	304.96	(82)
Rooflights _{0.9x}	1	X	1.13		х	189	j × į	0.76	×	0.7		102.26	(82)
Rooflights 0.9x	1	X	0.98		х	189	וֹ × וֹ	0.76	X	0.7	-	88.68	(82)
Rooflights _{0.9x}	1	X	3.37		x	157] _x [0.76	×	0.7	=	253.33	(82)
Rooflights 0.9x	1	x	1.13		-	157] x	0.76	x	0.7	╡ -	84.94	(82)
Rooflights _{0.9x}	1	X	0.98		х	157] _x [0.76	- x	0.7	=	73.67	(82)
Rooflights _{0.9x}	1	X	3.37		x	115] _x [0.76	×	0.7	=	185.56	(82)
Rooflights _{0.9x}	1	X	1.13		х	115] _x [0.76	×	0.7	=	62.22	(82)
Rooflights _{0.9x}	1	X	0.98		х	115] _× [0.76	- x	0.7	=	53.96	(82)
Rooflights _{0.9x}	1	X	3.37		x	66] _x [0.76	×	0.7	= =	106.49	(82)
Rooflights _{0.9x}	1	X	1.13		х	66] _x [0.76	×	0.7	=	35.71	(82)
Rooflights 0.9x	1	X	0.98		X	66] _x [0.76	×	0.7		30.97	(82)
Rooflights _{0.9x}	1	X	3.37		X	33] _x [0.76	×	0.7		53.25	(82)
Rooflights _{0.9x}	1	X	1.13		X	33] _x [0.76	×	0.7		17.85	(82)
Rooflights _{0.9x}	1	X	0.98		X	33] _x [0.76	×	0.7		15.48	(82)
Rooflights 0.9x	1	X	3.37		X	21] _x [0.76	x	0.7	=	33.88	(82)
Rooflights _{0.9x}	1	X	1.13		X	21] _x [0.76	×	0.7		11.36	(82)
Rooflights _{0.9x}	1	X	0.98		X	21] _x [0.76	×	0.7		9.85	(82)
ı													
Solar gains in	watts, cal	culated	for each	month			(83)m	= Sum(74)m .	(82)m				
(83)m= 386.5			1468.94 1			1729.37		.36 1201.89	802.52	470.83	325.54		(83)
Total gains – i	nternal an	d solar	(84)m = ((73)m -	+ (83)m	, watts						_	
(84)m= 874.17	1185.85	1529.91	1912.8 2	192.93	2209.01	2105.15	1876	.58 1597.44	1224.0	5 922.25	799.69		(84)
7. Mean inter	nal tempe	erature ((heating s	eason)								
						from Tal	ble 9,	Th1 (°C)				21	(85)
Temperature				h1 m	(see Ta	ıble 9a)							
Temperature Utilisation fac	•	ins for li	iving area	, 111,111			_			T		1	
•	•	ins for li Mar	iving area Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
Utilisation fac	ctor for ga				r`	Jul 0.32	0.3		Oct 0.9	0.98	Dec 1	1	(86)
Utilisation factors Jan (86)m= 0.99	Feb 0.98	Mar 0.93	Apr 0.8	May 0.61	Jun 0.43	0.32	0.3	7 0.62		+	—	•	(86)
Utilisation fac	Feb 0.98	Mar 0.93	Apr 0.8 iving area	May 0.61	Jun 0.43	0.32	0.3	7 0.62 able 9c)		0.98	—] 1	(86) (87)
Utilisation factors Jan (86)m= 0.99 Mean internation (87)m= 19.57	Feb 0.98 tempera 19.89	0.93 ture in 1	Apr 0.8 iving area	May 0.61 a T1 (fo 20.93	Jun 0.43 bllow ste 20.99	0.32 ps 3 to 7	0.3 7 in T	7 0.62 able 9c)	0.9	0.98	1]]	
Utilisation factors Jan (86)m= 0.99 Mean internal	Feb 0.98 tempera 19.89	0.93 ture in 1	Apr 0.8 iving area 20.72 eriods in 1	May 0.61 a T1 (fo 20.93	Jun 0.43 bllow ste 20.99	0.32 ps 3 to 7	0.3 7 in T	7 0.62 able 9c) 99 20.94 0, Th2 (°C)	0.9	0.98	1]] 1	

Utilisation	factor for g	ains for i	rest of di	vellina k	12 m (se	e Table	9a)						
(89)m= 0.9	 _	0.92	0.77	0.57	0.39	0.27	0.31	0.57	0.88	0.98	0.99		(89)
Mean inter	rnal temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	in Tabl	∟ е 9c)				
(90)m= 18.9	_ -	19.67	20.06	20.24	20.29	20.29	20.29	20.26	19.95	19.35	18.89		(90)
	I	!				l .		f	LA = Livin	g area ÷ (4	1) =	0.33	(91)
Mean inte	rnal temper	ature (fo	r the wh	ole dwel	lina) = fl	A × T1	+ (1 – fl	A) × T2			ľ		_
(92)m= 19.1		19.88	20.28	20.46	20.52	20.53	20.52	20.48	20.16	19.56	19.09		(92)
	 istment to t	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	priate				
(93)m= 19.7		20.48	20.88	21.06	21.12	21.13	21.12	21.08	20.76	20.16	19.69		(93)
8. Space h	neating req	uirement											
	ne mean int		•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	factor for g	ains, hm):										
(94)m= 0.9	9 0.97	0.92	0.79	0.61	0.44	0.33	0.38	0.62	0.89	0.98	0.99		(94)
Useful gai	ns, hmGm	, W = (94	4)m x (84	4)m									
(95)m= 866.	34 1152.57	1407.34	1519.62	1346.26	975.03	685.66	711.52	995.64	1094.06	903.82	794.58		(95)
	verage exte		i	from Ta	able 8								
(96)m= 4.3		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	rate for me					- ` 		<u> </u>		0040.4	0007.44		(07)
` '	.99 2360.41		1843.53		993.04	689.55	718.78		1560.82	2013.4	2397.11		(97)
(98)m= 1147	ating require	568.96	233.22	68.54	0	0.02	4 X [(97)	0 0	347.26	798.9	1192.29		
(00)111= 1147	.74 011.07	000.00	200.22	00.04	Ū	Ů			(kWh/year			5168.59	(98)
Space hea	ating require	ement in	kWh/m²	/vear			Tota	i pei yeai	(KVVII) year) = O uiii(3	O)15,912 —	47.78](99)
·				•	rotomo i	naludina	mioro C	·UD/					
9a. Energy Space hea		its – mai	ividuai ni	eaung sy	/stems ii	nciuaing	micro-C	лР)					
•	f space hea	at from so											
Fraction of	•	at 11 O111 O	econdar	//supple	mentary	system					[0	(201)
	f space hea				mentary	•	(202) = 1 -	- (201) =					(201)
Fraction of	•	at from m	nain syst	em(s)	mentary	·	(202) = 1 - (204) = (20		(203)] =			1	(202)
	f total heati	at from m	nain syst main sys	em(s) stem 1	mentary	·			(203)] =			1	(202)
Efficiency	•	at from ming from take	nain syst main sys ing syste	em(s) stem 1 em 1	·	·			(203)] =			1	(202)
Efficiency	f total heati of main spa of seconda	at from ming from take	main syst main sys ing syste	em(s) stem 1 em 1 y heating	g system	·	(204) = (20	02) × [1 –	(203)] =	Nov	Dec	1 1 85.4 0	(202) (204) (206) (208)
Efficiency Efficiency Ja	f total heati of main spa of seconda	at from m ng from ace heat ry/supple Mar	nain syst main sys ing syste ementar	em(s) stem 1 em 1 y heating	g system Jun	1, %				Nov	Dec	1 1 85.4	(202) (204) (206) (208)
Efficiency Efficiency Ja	f total heati of main spa of seconda n Feb ating require	at from m ng from ace heat ry/supple Mar	nain syst main sys ing syste ementar	em(s) stem 1 em 1 y heating	g system Jun	1, %	(204) = (20	02) × [1 –		Nov 798.9	Dec 1192.29	1 1 85.4 0	(202) (204) (206) (208)
Efficiency Efficiency Ja Space hea	f total heati of main spa of seconda n Feb ating require 74 811.67	at from mager from mager heat ary/supplement (compared to 568.96	main systemain systemain systementary Apr alculated	em(s) stem 1 em 1 y heating May d above) 68.54	g system Jun	n, %	(204) = (204) Aug	02) × [1 -	Oct			1 1 85.4 0	(202) (204) (206) (208)
Efficiency Efficiency Ja Space hea	f total heati of main spa of seconda n Feb ating require 7.74 811.67 (98)m x (20	at from mager from mager heat ary/supplement (compared to 568.96	main systemain systemain systementary Apr alculated	em(s) stem 1 em 1 y heating May d above) 68.54	g system Jun	n, %	(204) = (204) Aug	02) × [1 -	Oct			1 1 85.4 0	(202) (204) (206) (208) ar
Efficiency Efficiency Ja Space hea 1147 (211)m = {[i	f total heati of main spa of seconda n Feb ating require 7.74 811.67 (98)m x (20	ng from mace heat ary/supple Mar ement (c 568.96	main systemain systementary Apr alculated 233.22	em(s) stem 1 em 1 y heating May d above) 68.54	g system Jun 0	n, % Jul 0	Aug 0	Sep 0	Oct 347.26	798.9 935.48	1192.29	1 1 85.4 0	(202) (204) (206) (208) ar
Efficiency Efficiency Ja Space hea 1147 (211)m = {[i	f total heati of main spa of seconda n Feb ating require 7.74 811.67 (98)m x (20	mat from mace heat mary/supplement (comparement (comparement) } x 1 666.24	main systemain systemain systementary Apr alculated 233.22 00 ÷ (20 273.09	em(s) stem 1 em 1 y heating May d above) 68.54 66) 80.26	g system Jun 0	n, % Jul 0	Aug 0	Sep 0	Oct 347.26 406.63	798.9 935.48	1192.29	1 1 85.4 0 kWh/ye	(202) (204) (206) (208) ar
Efficiency Efficiency Ja Space hea 1147 (211)m = {[i	f total heating of secondary requirements of	mat from many from mace heat many/supplement (company) Mar mement (company) 3 x 1 666.24 econdary	main systemain systemain systemantary Apr calculated 233.22 00 ÷ (20 273.09)	em(s) stem 1 em 1 y heating May d above) 68.54 66) 80.26	g system Jun 0	n, % Jul 0	Aug 0	Sep 0	Oct 347.26 406.63	798.9 935.48	1192.29	1 1 85.4 0 kWh/ye	(202) (204) (206) (208) ar
Efficiency Efficiency Ja Space hea 1147 (211)m = {[i] 1343	f total heating of secondary requirements of	mat from many from mace heat many/supplement (company) Mar mement (company) 3 x 1 666.24 econdary	main systemain systemain systemantary Apr calculated 233.22 00 ÷ (20 273.09)	em(s) stem 1 em 1 y heating May d above) 68.54 66) 80.26	g system Jun 0	n, % Jul 0	Aug 0 Tota	Sep 0 1 (kWh/yea	Oct 347.26 406.63 ar) =Sum(2	798.9 935.48 211) _{15,1012}	1192.29	1 1 85.4 0 kWh/ye	(202) (204) (206) (208) ar (211)
Efficiency Efficiency Ja Space hea 1147 (211)m = {[i] 1343 Space hea = {[(98)m x	f total heating of secondary requirements of	mat from mace heat ary/supplement (compared for feed for	main systemain systemain systematary Apr alculated 233.22 00 ÷ (20 273.09 y), kWh/8)	em(s) stem 1 em 1 y heating May d above) 68.54 e6) 80.26	g system Jun 0	o o	Aug 0 Tota	Sep 0 1 (kWh/yea	Oct 347.26 406.63 ar) =Sum(2	798.9 935.48 211) _{15,1012}	1192.29	1 1 85.4 0 kWh/ye	(202) (204) (206) (208) ar

Water heating								
Output from water heater (calculated above) 213.94 188.53 197.92 177.3 173.66 1	55.05 148.79	163.43	163.2	183.86	194.56	208.76		
Efficiency of water heater	!		l				75.3	(216)
(217)m= 87.64 87.11 85.95 83.19 79.04	75.3 75.3	75.3	75.3	84.53	86.98	87.78		(217)
Fuel for water heating, kWh/month			-					
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 244.12 216.44 230.27 213.12 219.73 2	205.91 197.6	217.04	216.73	217.5	223.67	237.83		
	<u>!</u>	Tota	I = Sum(2	19a) ₁₁₂ =			2639.95	(219)
Annual totals				k\	Wh/year		kWh/year	⊿ _
Space heating fuel used, main system 1							6052.21	
Water heating fuel used							2639.95	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						39		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			84	(231)
Electricity for lighting							423.36	(232)
12a. CO2 emissions – Individual heating system	s including n	nicro-CHF)					
	Energy kWh/yea	r		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	1307.28	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	570.23	(264)
Change and water heating								
Space and water heating	(261) + (262) + (263) + ((264) =				1877.51	(265)
Electricity for pumps, fans and electric keep-hot	(261) + (262 (231) x) + (263) + ((264) =	0.5	19	=	1877.51 43.6	(265) (267)
•	, , ,) + (263) + ((264) =	0.5		=		_
Electricity for pumps, fans and electric keep-hot	(231) x) + (263) + (,		19		43.6	(267)

El rating (section 14)

(274)

		User Details:				
Assessor Name:	Su Lee	Stroma Num	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Versio	n: 1.0.4.16	
	Pro	perty Address: Unit 04	4			
Address :	138-140 Highgate Road, High	igate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:				(a)	
Basement		Area(m²) 41.19 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)
Ground floor		35.68 (1b) x	3.2	$\begin{bmatrix} (2b) & = \end{bmatrix}$	114.18	(3b)
First floor		32.25 (1c) x	4.65	(2c) = [149.96] (3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	109.12 (4)		l L		_
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	.(3n) =	375.35	(5)
2. Ventilation rate:				_		
	main secondary heating heating	other	total		m³ per hour	•
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		5 x 1	0 =	50	(7a)
Number of passive vents			0 x 1	0 =	0	(7b)
Number of flueless gas fi	res		0 x 4	10 =	0	(7c)
				Air cha	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	50	÷ (5) =	0.13	(8)
	een carried out or is intended, proceed t	to (17), otherwise continue t	from (9) to (16)	-		_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0	•	ruction	L	0	(11)
if both types of wall are pi deducting areas of openir	resent, use the value corresponding to things); if equal user 0.35	ne greater wall area (after				
=	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		Γ	0	(12)
If no draught lobby, en	ter 0.05, else enter 0			Ī	0	(13)
Percentage of windows	s and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	Ī	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope	area	4	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		Ī	0.33	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used	_		_
Number of sides sheltere	ed				2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	[19)] =	L	0.85	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =		[0.28	(21)
Infiltration rate modified f	or monthly wind speed	, ,	, ,			
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>	<u> </u>			
Adjusted infiltra		· · · · · ·				. 	`´	`´			0.00		
0.36 Calculate effec	0.35 ctive air	0.35 Change	0.31 rate for t	0.3 he appli	0.27 Cable ca	0.27 S e	0.26	0.28	0.3	0.32	0.33		
If mechanica		-			- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	heat reco	very: effic	iency in %	allowing for	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	l – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		<u> </u>	<u> </u>		<u> </u>	· ` `	ŕ		· ` ·				(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(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		(24d)
Effective air			<u> </u>			<u> </u>	<u> </u>						
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
									•	•			
3 Heat Insses	s and he	at Ince i	naramete	or.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value	<u>.</u>	AXk
3. Heat losses		SS	oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				K)			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	K)			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 4.86	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.46 4.86 5.21	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	K)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86 6.44	K)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	K)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 e 1	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 3	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547 1.54 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3 10.2 1.38	ss (m²)	0 4.86	gs 2	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19 10.29 -0.05	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547 1.54 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 3 1	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547 1.54 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8 ×	0.15	0.12			(29)
Walls Type7 0.96 0	0.96 ×	0.15	0.14			(29)
Walls Type8 6.62 0	6.62 ×	0.15	0.99			(29)
Walls Type9 4.96 0	4.96 ×	0.15	0.74			(29)
Walls Type10 5.76 4.86	0.9 ×	0.15	0.14			(29)
Walls Type11 0.42 0	0.42 ×	0.15	0.06			(29)
Walls Type12 6.4 0	6.4 ×	0.15	0.96			(29)
Walls Type13 9.11 5.29	3.82 ×	0.15	0.57			(29)
Walls Type14 1.86 0	1.86 ×	0.15	0.28			(29)
Walls Type15 8.6 2.46	6.14 ×	0.15	0.92			(29)
Walls Type16 9.3 0	9.3 ×	0.15	= 1.4			(29)
Walls Type17 0.6 0	0.6 ×	0.15	= 0.09			(29)
Walls Type18 8.37 4.86	3.51 ×	0.15	= 0.53			(29)
Roof Type1 31.76 4.5	27.26 ×	0.13	3.54			(30)
Roof Type2 3.67 0.98	2.69 x	0.13	= 0.35		ī 💳	(30)
Total area of elements, m ²	168.58				<u> </u>	(31)
Party wall	29.65 ×	0 =	= 0		1	(32)
Party wall	28.67 ×	(0 =	= 0		i 💳	(32)
Party wall	33.12 ×	(0 =	= 0		i 💳	(32)
Party wall	34.08 ×	(0 =	= 0		i 💳	(32)
Party wall	38.73 ×	(0 =	= 0		ī Ē	(32)
Party wall	40 x	(0 =	= 0		ī Ē	(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa		ng formula 1/[(1/U-v	alue)+0.04] as given i	in paragraph 3	3.2	
Fabric heat loss, W/K = S (A x U)	Tution C	(26)(30) + (32)	=	Г	70.74	(33)
Heat capacity Cm = S(A x k)		((28	3)(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indi	icative Value: Medium	, <u> </u>	250	(35)
For design assessments where the details of the construct	ction are not known į	precisely the indicat	ive values of TMP in	Table 1f		
can be used instead of a detailed calculation. Thermal bridges: S(L x Y) calculated using A	nnendiy K			Г	15.07	(36)
if details of thermal bridging are not known (36) = 0.15×10^{-2}	• •			L	15.97	(30)
Total fabric heat loss	,	(33) + (36) =	Γ	86.7	(37)
Ventilation heat loss calculated monthly		(38	$m = 0.33 \times (25) m \times$	5)		_
Jan Feb Mar Apr May	Jun Jul	Aug Se	Oct Nov	Dec		
(38)m= 70.01 69.7 69.39 67.94 67.67	66.42 66.42	66.18 66.9	67.67 68.22	68.79		(38)
Heat transfer coefficient, W/K		(39	m = (37) + (38)m			
(39)m= 156.71 156.4 156.09 154.65 154.38	153.12 153.12	2 152.89 153.6	5 154.38 154.92	155.5		_
Heat loss parameter (HLP), W/m²K		(40	Average = Sum(39) $m = (39)m \div (4)$)112 /12=	154.65	(39)
(40)m= 1.44 1.43 1.43 1.42 1.41	1.4 1.4	1.4 1.41		1.42		
Number of days in month (Table 1a)			Average = Sum(40))112 /12=	1.42	(40)
Jan Feb Mar Apr May	Jun Jul	Aug Sei	o Oct Nov	Dec		
Can I too I mai I hai	1 5311 541	19 00	2 300 1400	1 200		

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	iting ene	rgy requi	irement:								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 (¯	ΓFA -13.		81		(42)
Annual average Reduce the annual not more that 123	ge hot wa gal average	hot water	usage by	5% if the a	lwelling is	designed			se target of).92		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 111.02	106.98	102.94	98.91	94.87	90.83	90.83	94.87	98.91	102.94	106.98	111.02		,
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600		Total = Sur oth (see Ta	· /		1211.09	(44)
(45)m= 164.63	143.99	148.59	129.54	124.3	107.26	99.39	114.05	115.41	134.5	146.82	159.44		
If instantaneous	water heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Γotal = Sur	m(45) ₁₁₂ =		1587.93	(45)
(46)m= 24.7	21.6	22.29	19.43	18.64	16.09	14.91	17.11	17.31	20.18	22.02	23.92		(46)
Water storage					/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				1			' 	
Storage volun	•		•			•		ame ves	sel		210		(47)
If community Otherwise if n	_			_			` '	ers) ente	er 'O' in <i>(</i>	4 7)			
Water storage		not wate) (till) li	ioiddc3 i	Hotaritai	icous cc	ATTION DOIL	Cio, Cill) III (·	T')			
a) If manufac		eclared I	oss fact	or is kno	wn (kWh	n/day):				1.	57		(48)
Temperature	factor fro	m Table	2b							0.	54		(49)
Energy lost from		•					(48) x (49)) =		0.	85		(50)
b) If manufact Hot water stor			•								0		(51)
If community	•			((((((((((((((((((((.,	-77					0		(= -)
Volume factor	from Ta	ble 2a									0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost from		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	. , .	•								0.	85		(55)
Water storage	loss cal	culated 1	for each	month	_		((56)m = (55) × (41)ı	m				
(56)m= 26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(56)
If cylinder contain	ns dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (I	H11) is fro	m Append	ix H	
(57)m= 26.28	23.74	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(57)
Primary circui	•	•									0		(58)
Primary circui				,	•	. ,	, ,		. 41- 0	o4o4\			
(modified b) (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)
` ′		ļ	<u> </u>	<u>!</u>	<u>!</u>	<u> </u>		22.31	23.20	22.51	23.20		(00)
Combi loss ca	1	1	i	`	`	- ` `				6			(61)
(61)m= 0	0	0	0	0	0	0	(00)	0	0	0	0	(50) (01)	(61)
			eating ca		for eac	n month 148.94	`	0.85 × (45)m + (184.05	(46)m +	<u> </u>	(59)m + (61)m	(62)
(62)m= 214.18	100.74	198.13	177.49	173.84	155.2	140.94	163.6	103.30	104.05	194.//	208.98		(62)

Solar DHW input calcula	ted using App	oendix G o	r Appendix	H (nega	tive quantit	y) (en	ter '0'	if no solar	contrib	ution to wate	er heating)	
(add additional line	if FGHRS	and/or \	WWHRS	applie	s, see Ap	pend	dix G	i)				_	
(63)m = 0 0	0	0	0	0	0	(0	0	0	0		(63)
Output from water I	eater												
(64)m= 214.18 188.	74 198.13	177.49	173.84	155.2	148.94	163	3.6	163.36	184.0	194.77	208.98		
	-			-			Outpu	ut from wa	iter hea	ter (annual) ₁	12	2171.27	(64)
Heat gains from wa	ter heating	, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	1 + (6	31)m]] + 0.8 x	[(46)r	n + (57)m	+ (59)m	n]	
(65)m= 94.38 83.6	89.04	81.43	80.96	74.02	72.68	77.	.56	76.73	84.36	87.18	92.65		(65)
include (57)m in	calculation	of (65)m	only if c	ylinder	is in the	dwel	ling c	or hot wa	ater is	from com	munity l	neating	
5. Internal gains (see Table	5 and 5a	ı):										
Metabolic gains (Ta	ble 5), Wa	tts											
Jan Fe		Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(66)m= 140.47 140.	47 140.47	140.47	140.47	140.47	140.47	140).47	140.47	140.47	7 140.47	140.47	1	(66)
Lighting gains (calc	ulated in A	ppendix	L, equat	ion L9	or L9a), a	ılso s	see T	able 5		-		_	
(67)m= 24.1 21.	4 17.41	13.18	9.85	8.32	8.99	11.	.68	15.68	19.9	23.23	24.77]	(67)
Appliances gains (d	alculated i	n Appen	dix L, eq	uation	L13 or L1	3a),	also	see Tab	ole 5	•		-	
(68)m= 270.29 273.	09 266.02	250.98	231.98	214.13	202.21	199	9.4	206.47	221.52	2 240.51	258.36]	(68)
Cooking gains (cald	ulated in A	ppendix	L, equa	tion L1	or L15a), als	so se	e Table	5	•	•	_	
(69)m= 37.05 37.0	5 37.05	37.05	37.05	37.05	37.05	37.	.05	37.05	37.05	37.05	37.05]	(69)
Pumps and fans ga	ins (Table	5a)		!						- !	!	4	
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. evapor	ation (nega	tive valu	ies) (Tab	le 5)	•			<u>.</u>		•		•	
(71)m= -112.38 -112	38 -112.38	-112.38	-112.38	-112.38	-112.38	-112	2.38	-112.38	-112.3	3 -112.38	-112.38]	(71)
Water heating gain:	(Table 5)	•	•	•	•			•		•	•	_	
(72)m= 126.85 124.	52 119.68	113.1	108.82	102.81	97.69	104	1.24	106.57	113.38	3 121.08	124.53]	(72)
Total internal gain	s =	•	•	(6	6)m + (67)n	n + (68	8)m +	(69)m + (7	70)m +	(71)m + (72)	m	_	
(73)m= 489.37 487.	15 471.25	445.39	418.8	393.39	377.02	383	3.47	396.86	422.95	5 452.96	475.8]	(73)
6. Solar gains:	,				•					,			
Solar gains are calcula	ted using sola	ar flux from	Table 6a	and asso	ciated equa	ations	to cor	nvert to the	e applic	able orientat	ion.		
Orientation: Acces		Area	l		ux			g_ -		FF		Gains	
Table	6d	m²		1	able 6a		18	able 6b		Table 6c		(W)	
Northeast 0.9x	.77 ×	5.2	29	x	11.28	X		0.76	X	0.7	=	22.01	(75)
Northeast 0.9x	.77 ×	5.2	29	x	11.28	X		0.76	X	0.7	=	22.01	(75)
Northeast 0.9x	.77 ×	5.2	29	x	22.97	X		0.76	X	0.7	=	44.79	(75)
Northeast 0.9x	.77 ×	5.3	29	x	22.97	X		0.76	X	0.7	=	44.79	(75)
Northeast 0.9x	.77 ×	5.3	29	x	41.38	X		0.76	x	0.7	=	80.7	(75)
Northeast 0.9x	.77 ×	5.2	29	x	41.38	X		0.76	x	0.7	=	80.7	(75)
Northeast 0.9x	.77 ×	5.2	29	x	67.96	X		0.76	x	0.7	=	132.53	(75)
Northeast _{0.9x}	.77 ×	5.2	29	x	67.96	x		0.76	X	0.7		132.53	(75)
Northeast _{0.9x}	.77 ×	5.2	29	x	91.35	X		0.76	×	0.7	=	178.15	(75)
Northeast _{0.9x}	.77 ×	5.2	29	x	91.35	X		0.76	X	0.7	=	178.15	(75)

Northeast _{0.9x}	0.77] x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]] _x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] x	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	х	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7] =	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7	<u> </u>	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

							, ,						
Rooflights 0.9		X	0.98		X	96	_ x [0.76	X	0.7	=	45.05	(82)
Rooflights 0.9		х	3.37		X	150	X	0.76	X	0.7	=	242.03	(82)
Rooflights 0.9		х	1.13		x	150	_ x [0.76	X	0.7	=	81.16	(82)
Rooflights 0.9		X	0.98	<u> </u>	X	150	X	0.76	X	0.7	=	70.38	(82)
Rooflights 0.9	x 1	X	3.37	•	X	192	x[0.76	X	0.7	=	309.8	(82)
Rooflights 0.9	x 1	х	1.13	3	х	192	x	0.76	X	0.7	=	103.88	(82)
Rooflights 0.9	x 1	X	0.98	3	х	192] x [0.76	X	0.7	=	90.09	(82)
Rooflights 0.9	x 1	X	3.37	•	x	200] x	0.76	x	0.7	=	322.71	(82)
Rooflights 0.9	x 1	X	1.13	3	x	200] x	0.76	X	0.7	=	108.21	(82)
Rooflights 0.9	x 1	x	0.98	3	x	200] x [0.76	x	0.7	=	93.84	(82)
Rooflights 0.9	x 1	х	3.37	,	х	189	x	0.76	х	0.7	=	304.96	(82)
Rooflights 0.9	x 1	x	1.13	3	х	189	x	0.76	х	0.7	=	102.26	(82)
Rooflights 0.9	x 1	x	0.98	3	х	189	×	0.76	x	0.7	=	88.68	(82)
Rooflights 0.9	x 1	x	3.37	•	х	157	×	0.76	x	0.7	=	253.33	(82)
Rooflights 0.9	x 1	x	1.13	3	х	157	x	0.76	х	0.7	=	84.94	(82)
Rooflights 0.9	x 1	x	0.98	3	х	157	×	0.76	x	0.7	=	73.67	(82)
Rooflights 0.9	x 1	x	3.37	.	х	115	×	0.76	x	0.7		185.56	(82)
Rooflights 0.9	x 1	x	1.13		х	115	×	0.76	x	0.7	=	62.22	(82)
Rooflights 0.9	x 1	x	0.98		х	115	i x	0.76	x	0.7	 =	53.96	(82)
Rooflights 0.9	x 1	x	3.37	•	х	66	i x	0.76	х	0.7	=	106.49	(82)
Rooflights 0.9	x 1	x	1.13		х	66	j × [0.76	x	0.7	=	35.71	(82)
Rooflights 0.9	x 1	x	0.98	;	х	66	i × [0.76	x	0.7		30.97	(82)
Rooflights 0.9	x 1	x	3.37	,	х	33] x [0.76	х	0.7	=	53.25	(82)
Rooflights 0.9	x 1	x	1.13		х	33	j × [0.76	x	0.7	=	17.85	(82)
Rooflights 0.9	x 1	x	0.98	;	х	33	i × [0.76	x	0.7		15.48	(82)
Rooflights 0.9	x 1	x	3.37	,	х	21] x [0.76	х	0.7	=	33.88	(82)
Rooflights 0.9	x 1	x	1.13		х	21	j × [0.76	x	0.7	=	11.36	(82)
Rooflights 0.9	x 1	×	0.98	;	х	21	i x	0.76	x	0.7		9.85	(82)
									_ '				
Solar gains	in watts, ca	alculated	for each	month			(83)m	= Sum(74)m .	(82)m				
(83)m= 386	5 700.4	1060.31	1468.94	1775.54	1816.92	1729.37	1494	.36 1201.89	802.52	470.83	325.54		(83)
Total gains	– internal a	and solar	(84)m =	(73)m ·	+ (83)m	, watts						-	
(84)m= 875.	1187.55	1531.55	1914.33	2194.34	2210.32	2106.39	1877	.82 1598.75	1225.4	7 923.79	801.33		(84)
7. Mean in	ternal temp	perature	(heating s	season)								
Temperatu	re during h	neating p	eriods in	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation	actor for g	ains for I	iving area	a, h1,m	(see Ta	able 9a)							
Ja	n Feb	Mar	Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(86)m= 0.9	0.98	0.93	0.8	0.61	0.44	0.32	0.3	7 0.62	0.9	0.98	1		(86)
Mean inter	nal temper	ature in l	living area	a T1 (fo	ollow ste	eps 3 to 7	7 in Ta	able 9c)		-			
		1 1	20.72	20.93	20.99	21	20.9	- 	20.59	19.98	19.51]	(87)
(87)m= 19.5	7 19.89	20.31	0			I				I			
` '					<u>!</u>	ļ		!!			!	J	
(87)m= 19.5 Temperatu (88)m= 20.2	re during h				<u>!</u>	ļ		, Th2 (°C)	20.29	20.29	20.29]	(88)

Utilisation factor for gains for rest of develling, 1,2,m (see Table 9a) (88)me	Utilisation fa	ctor for a	ains for	rest of d	welling l	n2 m (se	e Table	9a)						
(90)me 18.94 19.26 19.67 20.06 20.24 20.28 20.3 20.3 20.26 19.95 19.36 18.89 (90) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living ar			1			,	i		0.57	0.88	0.98	0.99		(89)
(90)me 18.94 19.26 19.67 20.06 20.24 20.28 20.3 20.3 20.26 19.95 19.36 18.89 (90) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 01) (1.A = Living area + (4) = 0.33 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 20.16 19.1 (1.A = Living area + (4) = 0.33 0.38 0.48 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living area + (4) = 0.90 0.90 0.90 0.90 0.90 0.90 (1.A = Living ar	Mean intern	al tempe	rature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	r in Tabl	e 9c)	<u> </u>	<u> </u>		
Mean intermal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 19.15 19.47 19.88 20.28 20.46 20.52 20.53 20.53 20.48 20.16 19.56 19.1 (92) Apply adjustment to the mean intermal temperature from Table 4e, where appropriate (93)m 19.75 20.07 20.48 20.88 21.06 21.12 21.13 21.08 20.76 20.16 19.7 (93)			i e			<u> </u>	i	<u> </u>		· ·	19.36	18.89		(90)
19.15 19.47 19.88 20.28 20.46 20.52 20.53 20.53 20.48 20.16 19.56 19.1 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate 19.75 20.07 20.48 20.88 20.88 21.08 21.13 21.08 20.76 20.16 19.7 (33) 38.5pace heating requirement temperature brown Table 4e, where appropriate 19.75 20.71 20.48 20.88 20.88 20.88 21.13 21.08 20.76 20.16 19.7 (33) 38.5pace heating requirement 19.75 20.07 20.48 20.88 20.88 20.88 21.13 21.08 20.76 20.16 19.7 (33) 38.5pace heating requirement 19.75 20.07 20.48 20.8			•						f	LA = Livin	g area ÷ (4	4) =	0.33	(91)
19.15 19.47 19.88 20.28 20.46 20.52 20.53 20.53 20.48 20.16 19.56 19.1 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate 19.75 20.07 20.48 20.88 20.88 21.08 21.13 21.08 20.76 20.16 19.7 (33) 38.5pace heating requirement temperature brown Table 4e, where appropriate 19.75 20.71 20.48 20.88 20.88 20.88 21.13 21.08 20.76 20.16 19.7 (33) 38.5pace heating requirement 19.75 20.07 20.48 20.88 20.88 20.88 21.13 21.08 20.76 20.16 19.7 (33) 38.5pace heating requirement 19.75 20.07 20.48 20.8	Mean intern	al tempei	rature (fo	r the wh	ole dwel	ling) = fl	I A 🗴 T1	+ (1 – fl	A) × T2			ľ		
19.75 20.07 20.48 20.88 21.06 21.12 21.13 21.08 20.76 20.16 19.7 (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-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			`				i e	<u> </u>		20.16	19.56	19.1		(92)
19.75 20.07 20.48 20.88 21.06 21.12 21.13 21.08 20.76 20.16 19.7 (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-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		ment to t	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	L opriate		<u> </u>		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm (94)m= 0.99 0.97 0.92 0.8 0.62 0.44 0.33 0.38 0.63 0.9 0.98 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 0.862.1 1154.91 1410.82 1525.06 1352.44 980.05 689.36 715.33 1000.3 1097.2 905.73 796.34 (95) Monthly average external temperature from Table 8 (96)m= 0.43 0.9 0.5 0.5 0.8 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m) 1 (97)m= 2421.29 2372.21 2182.79 1852.73 1445.73 998.27 693.29 722.67 1072.88 1568.65 2023.64 2409.46 (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m= 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 0 350.76 804.89 1200.16 Total per year (kWh/year) = Sum(98)s2 = 5209 (98) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 1156.49 818.03 574.34 235.93 69.4 0 0 0 0 0 350.76 804.89 1200.16 Efficiency of secondary/supplementary heating system, % 0 (208) Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) In Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 1156.49 818.03 574.34 235.93 69.4 0 0 0 0 0 350.76 804.89 1200.16 Efficiency of secondary/supplementary heating system 9 (201) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating sys	· · · · - - ·		î .				i			<u> </u>	20.16	19.7		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Space he	ating req	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				•		ed at sto	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 0.99 0.97 0.92 0.8 0.62 0.44 0.33 0.38 0.63 0.9 0.98 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 868.21 1154.91 1410.82 1525.05 1352.44 980.05 689.36 715.33 1000.3 1097.2 905.73 796.34 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) - (97)m= 2421.29 2372.21 2182.79 1852.73 1445.73 998.27 693.29 722.67 1072.88 1588.65 2023.64 2409.46 (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (44)m (98)m= 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 Space heating: Fraction of space heat from secondary/supplementary systems including micro-CHP) Space heating: Fraction of space heat from main system 1 (204) = (202) x (1 - (203)) = 1 (204) Efficiency of main space heating system 1 (204) = (202) x (1 - (203)) = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (201) Efficiency of secondary/supplementary heating system, % 0 (208) Useful gains, hmCm, W = (94)m x (84)m Total per year (kWh/year) = Sum(98)sv = 5209 (98) Space heating requirement — Individual heating systems including micro-CHP) Fraction of space heat from main system 1 (204) = (202) x (1 - (203)) = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) x (1 - (203)) = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Fraction of space heat from Space heating system 1 (204) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (204) x (1 - (204)) = (20						Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m (95)m	Utilisation fa	ctor for g	ains, hm):										
(95)me 868.21 1154.91 1410.82 1525.05 1352.44 980.05 689.36 715.33 1000.3 1097.2 905.73 796.34 (95) Monthly average external temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean intermal temperature, Lm , W = (39)m × (93)m × (96)m 1 (97)me 2421.29 2372.21 2182.79 1852.73 1445.73 998.27 693.29 722.67 1072.88 1568.65 2023.64 2409.46 (97) Space heating requirement for each month, kWh/month = 0.024 × [(97)m = (95)m] × (41)m (98)me 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 Total per year (kWh/year) = Sum(98)ssv = 5209 (98) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (204) = (202) × [1 - (201)] = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % (202) = 1 - (201) = 1 (204) Efficiency of secondary/supplementary heating system, % (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 0 350.76 804.89 1200.16 (211)m = {[(98)m × (204)]} × 100 ÷ (206) Total (kWh/year) = Sum(211), s.sv = 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m × (201)]} × 100 ÷ (208)	(94)m= 0.99	0.97	0.92	0.8	0.62	0.44	0.33	0.38	0.63	0.9	0.98	0.99		(94)
Monthly average external temperature from Table 8 (96)m= 4.3	Useful gains	, hmGm	, W = (94	4)m x (84	4)m									
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 × (93)m - (96)m (97)m = 2421.29 2372.21 2182.79 1852.73 1445.73 998.27 693.29 722.67 1072.88 1568.65 2023.64 2409.46 (97) Space heating requirement for each month, kWh/month = 0.024 x (197)m - (95)m x (41)m (98)m = 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 Space heating requirement in kWh/m²/year 5209 (98) Space heating 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 (202) = 1 - (201) = 1 (202) Fraction of total heating from main system (204) = (202) x (1 - (203)) = 1 (204) Efficiency of main space heating system (204) = (202) x (1 - (203)) = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Space heating requirement (calculated above) (1155.49 818.03 574.34 235.93 69.4 0 0 0 0 0 350.76 804.89 1200.16 (211)m = { [(98)m x (204)] } x 100 ÷ (206) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (202) (211) (202) (202) (211) (202) (202) (211) (202	(95)m= 868.21	1154.91	1410.82	1525.05	1352.44	980.05	689.36	715.33	1000.3	1097.2	905.73	796.34		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)me 2421.29 2372.21 2182.79 1852.73 1445.73 998.27 693.29 722.67 1072.88 1568.65 2023.64 2409.46 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (98)me 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (98) Space heating requirement in kWh/m²/year 5209 (98) (98) Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heating from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) (211) (215.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (211) m = {[(98)m x (204)] } x 100 ÷ (206) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (211) (202) (202) (211) (202) (20		rage exte	ernal tem	perature	from Ta	able 8								
(97)me											7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 Total per year (kWh/year) = Sum(98)s2 = 5209 (98) Space heating requirement in kWh/m²/year							-`` /-		<u> </u>					(07)
1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16			l .									2409.46		(97)
Space heating requirement in kWh/m²/year Sum(98)su	-		T				1				·	1200 16		
Space heating requirement in kWh/m²/year 47.74 (99) Space heating: Fraction of space heat from secondary/supplementary system 5	(90)111= 1133.4	9 010.03	374.54	200.90	03.4	U				<u> </u>	<u> </u>	L	5200	7(98)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 85.4 (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) 1155.49 818.03 574.34 235.93 69.4 0 0 0 350.76 804.89 1200.16 (211)m = {[(98)m x (204)] } x 100 ÷ (206) Total (kWh/year) = Sum(211) _{1.2,1012} = 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (208)	Space heati	na reauir	ement in	kWh/m²	:/vear			Tota	i per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡``
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 85.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 1155.49 818.03 574.34 235.93 69.4 0 0 0 350.76 804.89 1200.16 (211) (211)m = {[(98)m x (204)]} x 100 ÷ (206) Total (kWh/year) = Sum(211)_1.51012 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)	·	• ,			•	ratama i	poludipa	mioro C	ירוט/				77.17	
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (211) m = {[(98)m x (204)]} x 100 ÷ (206) 1353.03 957.88 672.53 276.27 81.27 0 0 0 0 410.72 942.5 1405.34 Total (kWh/year) = Sum(211), 4.0			nts – Ina	ividuai n	eating sy	/stems i	ncluaing	micro-C	,HP)					
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (211) m = {[(98)m x (204)] } x 100 ÷ (206) 1353.03 957.88 672.53 276.27 81.27 0 0 0 0 410.72 942.5 1405.34 Total (kWh/year) = Sum(211) Latorz 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)	•	_	at from s	econdar	v/supple	mentary	system						0	(201)
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) (204) (205) (208) (•				,	•	(202) = 1 -	- (201) =			ļ	1	╡
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) [1155.49] 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (211) m = {[(98) m x (204)] } x 100 ÷ (206) [211) m = {[(98) m x (204)] } x 100 ÷ (206) Total (kWh/year) = Sum(211) _{1,1012} 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98) m x (201)] } x 100 ÷ (208)		•		-	, ,			(204) = (20	02) × [1 –	(203)] =				╡`
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year			Ū	•										╡`
Space heating requirement (calculated above) 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (211)m = {[(98)m x (204)]} x 100 ÷ (206) 1353.03 957.88 672.53 276.27 81.27 0 0 0 0 410.72 942.5 1405.34 Total (kWh/year) = Sum(211),5,1012 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)	•	•				g system	ո, %						0	(208)
Space heating requirement (calculated above) 1155.49 818.03 574.34 235.93 69.4 0 0 0 0 350.76 804.89 1200.16 (211)m = {[(98)m x (204)]} x 100 ÷ (206) 1353.03 957.88 672.53 276.27 81.27 0 0 0 0 410.72 942.5 1405.34 Total (kWh/year) = Sum(211),5,1012 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
$ (211) m = \{ [(98) m \ x \ (204)] \ \} \ x \ 100 \div (206) $ $ (211) m = \{ [(98) m \ x \ (204)] \ \} \ x \ 100 \div (206) $ $ (211) m = \{ [(98) m \ x \ (201)] \ \} \ x \ 100 \div (208) $ $ (211) m = \{ [(98) m \ x \ (201)] \ \} \ x \ 100 \div (208) $ $ (211) m = \{ [(98) m \ x \ (201)] \ \} \ x \ 100 \div (208) $	Space heati	ng requir	ement (c		d above)		l						·	
1353.03 957.88 672.53 276.27 81.27 0 0 0 0 410.72 942.5 1405.34 Total (kWh/year) = Sum(211),5,1012 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)	1155.4	9 818.03	574.34	235.93	69.4	0	0	0	0	350.76	804.89	1200.16		
Total (kWh/year) = Sum(211) _{15,1012} = 6099.53 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)	(211)m = {[(9	8)m x (20)4)] } x 1	00 ÷ (20	16)									(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)	1353.0	3 957.88	672.53	276.27	81.27	0	0	0	0	410.72	942.5	1405.34		
$= \{[(98)m \times (201)]\} \times 100 \div (208)$		•					!	Tota	l (kWh/yea	ar) =Sum(2	211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	=	6099.53	(211)
	Space heati	ng fuel (s	econdar	y), kWh/	month									_
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$= \{[(98)m \times (2)]\}$	201)] } x 1	00 ÷ (20	8)										
	(215)m= 0	0	0	0	0	0	0		_					_
Total (kWh/year) =Sum(215) _{15,1012} = 0 (215)								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)

Water heating								
Output from water heater (calculated above) 214.18 188.74 198.13 177.49 173.84 1	155.2 148.9	4 163.6	163.36	184.05	194.77	208.98]	
Efficiency of water heater	l		<u> </u>	l	<u> </u>	<u> </u>	75.3	(216)
(217)m= 87.65 87.12 85.98 83.23 79.07	75.3 75.3	75.3	75.3	84.56	87	87.79		(217)
Fuel for water heating, kWh/month								
(219) m = (64) m x $100 \div (217)$ m (219)m = 244.35 216.63 230.44 213.24 219.86 2	206.12 197.7	9 217.26	216.95	217.64	223.87	238.05]	
` '			l = Sum(2	19a) ₁₁₂ =			2642.2	(219)
Annual totals				k\	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1							6099.53	
Water heating fuel used							2642.2	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						39]	(230c)
boiler with a fan-assisted flue						45]	(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			84	(231)
Electricity for lighting							425.55	(232)
12a. CO2 emissions – Individual heating system	s including	nicro-CHF)					
	Energy kWh/yea	ar		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	1317.5	(261)
Space heating (secondary)								_
-part	(215) x			0.5	19	=	0	(263)
Water heating	(215) x (219) x			0.5		=	0 570.72	(263) (264)
	(219) x	2) + (263) +	(264) =					
Water heating	(219) x	2) + (263) +	(264) =		16		570.72	(264)
Water heating Space and water heating	(219) x (261) + (26	2) + (263) +	(264) =	0.2	16	=	570.72	(264)
Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(219) x (261) + (26 (231) x	2) + (263) +	` '	0.2	19	=	570.72 1888.22 43.6	(264) (265) (267)

El rating (section 14)

(274)

		User Details:			
Assessor Name:	Su Lee	Stroma Num	iber: ST	RO031315	
Software Name:	Stroma FSAP 2012	Software Ve		rsion: 1.0.4.16	
	F	Property Address: Unit 05	5		
Address :	138-140 Highgate Road, Hi	ghgate, Highgate, NW5	1PB		
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m³)
Basement		41.06 (1a) x	2.7 (2a)	= 110.86	(3a)
Ground floor		35.9 (1b) x	3.2 (2b)	= 114.88	(3b)
First floor		32.25 (1c) x	4.65 (2c)	= 149.96	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 109.21 (4)			
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+(3n)	375.7	(5)
2. Ventilation rate:					
	main seconda heating heating	ry other	total	m³ per hou	r
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ins		5 x 10 =	50	(7a)
Number of passive vents	3		0 x 10 =	0	(7b)
Number of flueless gas f	ires		0 x 40 =	0	(7c)
			Aiı	r changes per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	50 ÷ (5) =	0.13	(8)
If a pressurisation test has b	peen carried out or is intended, procee	ed to (17), otherwise continue fi	rom (9) to (16)		_
Number of storeys in t	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0.1	0	(10)
	2.25 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 greater wan area (alter			
If suspended wooden	floor, enter 0.2 (unsealed) or 0	.1 (sealed), 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 x (14) ÷ 1	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (11)	12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metre	es per hour per square m	netre of envelope area	4	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + (18)$	8), otherwise (18) = (16)		0.33	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a degree air permeability	is being used		
Number of sides sheltered	ed			2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =	0.85	(20)
Infiltration rate incorpora	ting shelter factor	$(21) = (18) \times (20) =$		0.28	(21)
Infiltration rate modified	for monthly wind speed				
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov D	ec	
Monthly average wind sp	peed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltra	ation rate	e (allowi	na for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	!				
0.36	0.35	0.35	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33		
Calculate effect		_	rate for t	he appli	cable ca	se	ļ	<u> </u>	!	ļ			
If mechanica			l' N (0	OL) (00	/		15// (1	. (00)	\ (00 \			0	
If exhaust air he		•	,	, ,	,			,)) = (23a)		[0	
If balanced with		-	•	_					Ob\ma . (00h) [4	(22.5)	. 4001	(23c)
a) If balance	o mecha	o 0	nillation 0	with nea	at recove		1R) (248	$\frac{1}{1} = \frac{2}{1}$	2b)m + (.	23b) x [0 (23C)	÷ 100]	(24a)
b) If balance	_										Ů		(Σ ια)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h						/entilatio	n from c	L outside					, ,
if (22b)m				•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural													
if (22b)m			· `		<u> </u>								(5.4.1)
(24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(24d)
Effective air			<u> </u>	<u> </u>	``	``	. 	`		0.55	0.50		(05)
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
3. Heat losses	s and he	at loss p	oaramete	er:									
3. Heat losses	s and he Gros area	ss	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
	Gros	ss	Openin	gs						<) 			
ELEMENT	Gros area	ss	Openin	gs	A ,n	n² x	W/m2	=	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m ² x x x1/	W/m2	eK = 0.04] =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	ss	Openin	gs	A ,n 2.46 4.86	x 1/	W/m2 1.4 /[1/(1.4)+	0.04] = 0.04] =	(W/I 3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 2	ss	Openin	gs	A ,r 2.46 4.86 5.21	x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	<)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 2 2 3 4 4	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4	x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	<) 			kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 3 4 4 5	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86	x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44	<)			kJ/K (26) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 6 6	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29	x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 5 6 6 7	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 1 2 2 3 4 4 5 6 6 7 6 1	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 1 2 2 3 3 4 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 1 2 2 3 3 4 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ	Gros area 1 1 2 2 3 3 4 4 5 6 7 e 1 e 2	es (m²)	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Floor	Gros area 1 1 2 2 3 4 4 5 6 6 7 6 1 6 2 6 2 6 3	ss (m²)	Openin	gs ₁ ²	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3378				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 1 6 2 6 3	ss (m²)	Openin m	gs ₁ ²	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 4.718 1.582 1.372 5.3378 1.55				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1 Walls Type2	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 1 6 2 7 6 2 6 3 5.08	ss (m²)	Openin m	gs ₁ 2	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06 10.31	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3378 1.55 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1 Walls Type2 Walls Type3	Gros area 11 22 33 44 55 66 7 e 1 e 2 e 3 10.3	1 3 1	0 4.86 1.4	gs ₁₂	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06 10.31 0.22 -0.05	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 4.718 1.582 1.372 5.3378 1.55 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Walls Type6 0.8 0	0.8 ×	0.15 =	0.12			(29)
Walls Type7 0.96 0	0.96 ×	0.15 =	0.14			(29)
Walls Type8 6.75 0	6.75 ×	0.15 =	1.01			(29)
Walls Type9 5 0	5 x	0.15 =	0.75			(29)
Walls Type10 5.76 4.86	0.9 ×	0.15 =	0.14			(29)
Walls Type11 0.42 0	0.42 ×	0.15	0.06			(29)
Walls Type12 6.4 0	6.4 ×	0.15 =	0.96			(29)
Walls Type13 9.11 5.29	3.82 ×	0.15 =	0.57			(29)
Walls Type14 1.86 0	1.86 ×	0.15 =	0.28			(29)
Walls Type15 8.6 2.46	6.14 ×	0.15 =	0.92			(29)
Walls Type16 9.3 0	9.3 ×	0.15 =	1.4			(29)
Walls Type17 0.6 0	0.6 ×	0.15 =	0.09			(29)
Walls Type18 8.37 4.86	3.51 ×	0.15 =	0.53			(29)
Roof Type1 31.76 4.5	27.26 ×	0.13 =	3.54		i	(30)
Roof Type2 3.34 0.98	2.36 ×	0.13 =	0.31		i	(30)
Total area of elements, m ²	168.31					(31)
Party wall	30.19 ×	0 =	0		7	(32)
Party wall	27.95 ×	0 =	0		ī	(32)
Party wall	33.7 ×	0 =	0		ī	(32)
Party wall	33.09 ×	0 =	0		ī	(32)
Party wall	38.73 ×	0 =	0		i	(32)
Party wall	40 x	0 =	0		i	(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa		ng formula 1/[(1/U-va	lue)+0.04] as given i	n paragraph :	3.2	_
Fabric heat loss, $W/K = S (A \times U)$	aration o	(26)(30) + (32) =	:	Г	70.7	(33)
Heat capacity Cm = S(A x k)		((28)	(30) + (32) + (32a))(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indic	ative Value: Medium	, F	250	(35)
For design assessments where the details of the constru	ction are not known p	precisely the indicativ	ve values of TMP in	Table 1f		
can be used instead of a detailed calculation.	nn andiv V			г		7(00)
Thermal bridges: $S(L \times Y)$ calculated using A if details of thermal bridging are not known (36) = 0.15 x	• •			L	15.95	(36)
Total fabric heat loss	101)	(33)	+ (36) =	Γ	86.65	(37)
Ventilation heat loss calculated monthly		(38)r	$m = 0.33 \times (25) m \times (8)$	5)		
Jan Feb Mar Apr May	Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 70.07 69.76 69.45 68 67.73	66.48 66.48	66.24 66.96	67.73 68.28	68.85		(38)
Heat transfer coefficient, W/K		(39)r	m = (37) + (38)m			
(39)m= 156.72 156.41 156.1 154.66 154.39	153.13 153.13	152.9 153.61	154.39 154.93	155.5		_
Heat loss parameter (HLP), W/m²K		(40)r	Average = Sum(39) $m = (39)m \div (4)$	112 /12=	154.66	(39)
(40)m= 1.44 1.43 1.43 1.42 1.41	1.4 1.4	1.4 1.41	1.41 1.42	1.42		
	1 1	1 1	Average = Sum(40)	-	1.42	(40)
Number of days in month (Table 1a)	ادا میرا ر	Aug Co-	Oct New			
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 he	ating ene	rgy requ	irement:								kWh/ye	ear:	
Assumed oc if TFA > 13 if TFA £ 13	3.9, N = 1		: [1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		81		(42)
Annual avera Reduce the annual not more that 12	age hot wa ual average	hot water	usage by	5% if the c	lwelling is	designed			se target o).94		(43)
Jan	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	e in litres pe	r day for ea			ctor from 7	Table 1c x							
(44)m= 111.0	3 106.99	102.96	98.92	94.88	90.84	90.84	94.88	98.92	102.96	106.99	111.03		,
Energy content	of hot water	· used - cal	culated m	onthly $= 4$.	190 x Vd,r	т х пт х <i>[</i>	OTm / 3600		Total = Sui oth (see Ta			1211.25	(44)
(45)m= 164.6		148.6	129.56	124.31	107.27	99.4	114.07	115.43	134.52	146.84	159.46		
If instantaneous	water heat	ing at point	t of use (n	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =		1588.14	(45)
(46)m= 24.7	21.6	22.29	19.43	18.65	16.09	14.91	17.11	17.31	20.18	22.03	23.92		(46)
Water storag	e loss:		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>				
Storage volu	•	,				_		ame ves	sel		210		(47)
If community	•			_			` '	ora) onto	or 'O' in <i>(</i>	47 \			
Otherwise if Water storage		not wate	ei (uiis ii	iciuaes i	HStaritar	ieous cc	ווטט וטווונ	ers) erite	ei U iii (47)			
a) If manufa		eclared l	oss fact	or is kno	wn (kWh	n/day):				1.	57		(48)
Temperature	factor fro	m Table	2b							0.	54		(49)
Energy lost f		•					(48) x (49)) =		0.	85		(50)
b) If manufa Hot water sto			,								0		(51)
If community	•			•		,							, ,
Volume factor											0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost f		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Enter (50) o	. , .	•	(l.				((50)	(55)		0.	85		(55)
Water storag							1	(55) × (41)					(50)
(56)m= 26.28 If cylinder conta		26.28	25.43 rage. (57)	26.28 m = (56)m	25.43 x [(50) – (26.28 H11)l ÷ (5	26.28 0), else (5	25.43 7)m = (56)	26.28 m where (25.43 H11) is fro	26.28 m Append	ix H	(56)
(57)m= 26.28		26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(57)
` '		ļ									0		(58)
Primary circu Primary circu	,	•			59)m = ((58) ÷ 36	65 × (41)	ım			U		(00)
(modified l					•	. ,	, ,		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) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	quired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 214.2	188.76	198.15	177.5	173.86	155.22	148.95	163.61	163.38	184.07	194.79	209		(62)

Solar DF	HW input o	calculated	using App	endix G o	r Appendix	H (ne	gative quantit	y) (en	ter '0	' if no solar	contrib	ution to wate	er heatin	g)		
(add ad	dditiona	l lines if	FGHRS	and/or	WWHRS	appl	es, see Ap	pen	dix C	3)						
(63)m=	0	0	0	0	0	0	0	(0	0	0	0	0			(63)
Output	from wa	ater hea	ter	_			_					_	_			
(64)m=	214.2	188.76	198.15	177.5	173.86	155.	22 148.95	163	3.61	163.38	184.07	194.79	209	┸		_
									Outp	out from wa	iter heat	ter (annual) ₁	12		2171.48	(64)
Heat g	ains froi	m water	heating	, kWh/m	onth 0.2	5 ´ [0.	85 × (45)m	1 + (6	61)m	n] + 0.8 x	[(46)n	n + (57)m	+ (59)	m]		
(65)m=	94.38	83.68	89.05	81.43	80.97	74.0	3 72.69	77.	.56	76.74	84.36	87.18	92.66			(65)
inclu	de (57)ı	m in cald	culation	of (65)m	only if c	ylinde	er is in the	dwel	ling	or hot wa	ater is	from com	munity	hea	ating	
5. Int	ernal ga	ains (see	Table	5 and 5a):											
Metabo	olic gain	s (Table	5), Wa	tts												
	Jan	Feb	Mar	Apr	May	Ju	n Jul	Α	ug	Sep	Oct	Nov	Dec	2		
(66)m=	140.5	140.5	140.5	140.5	140.5	140.	5 140.5	14	0.5	140.5	140.5	140.5	140.5			(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L	or L9a), a	also s	see -	Table 5		-	-	_		
(67)m=	24.11	21.41	17.41	13.18	9.85	8.32	8.99	11.	.69	15.68	19.91	23.24	24.78			(67)
Appliar	nces gai	ins (calc	ulated in	n Appen	dix L, eq	uatior	1 L13 or L1	3a),	alsc	see Tab	ole 5	-	-			
(68)m=	270.42	273.22	266.15	251.1	232.09	214.	23 202.3	19	9.5	206.57	221.62	2 240.62	258.48	3		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equa	tion L	15 or L15a), als	so se	ee Table	5					
(69)m=	37.05	37.05	37.05	37.05	37.05	37.0	5 37.05	37	.05	37.05	37.05	37.05	37.05			(69)
Pumps	and far	ns gains	(Table	5a)	•	•	•	•		•		•	•			
(70)m=	3	3	3	3	3	3	3] ;	3	3	3	3	3			(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	ies) (Tab	le 5)	•	•		•		•	•	_		
(71)m=	-112.4	-112.4	-112.4	-112.4	-112.4	-112	.4 -112.4	-11	2.4	-112.4	-112.4	-112.4	-112.4	1		(71)
Water	heating	gains (T	able 5)				•	•		'		•	•			
(72)m=	126.86	124.53	119.69	113.1	108.83	102.	97.7	104	1.25	106.58	113.39	121.09	124.5	4		(72)
Total i	nternal	gains =				•	66)m + (67)r	n + (6	8)m +	+ (69)m + (70)m +	(71)m + (72)	m			
(73)m=	489.53	487.31	471.4	445.53	418.93	393.	377.14	383	3.58	396.98	423.08	453.1	475.9	5		(73)
6. Sol	ar gains	S:					, ,	<u> </u>		,		·				
Solar g	ains are c	alculated	using sola	ar flux from	Table 6a	and as	sociated equa	ations	to co	onvert to the	e applic	able orientat	ion.			
Orienta		Access F		Area	1		Flux		_	g_ 		FF			Gains	
	_ _	able 6d		m²			Table 6a	_		able 6b		Table 6c			(W)	
Northea	ast _{0.9x}	0.77	Х	5.	29	x	11.28	X		0.76	x	0.7			22.01	(75)
Northea	ast _{0.9x}	0.77	Х	5.	29	x	11.28	X		0.76	x	0.7	=	= [22.01	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	X	22.97	X		0.76	x	0.7		•	44.79	(75)
Northea	ast _{0.9x}	0.77	Х	5.	29	x	22.97	X		0.76	x	0.7			44.79	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	41.38	x		0.76	x	0.7	=	-	80.7	(75)
Northea	ast _{0.9x}	0.77	Х	5.	29	x	41.38	x		0.76	x	0.7	-	-	80.7	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	67.96	x		0.76	x	0.7		• <u> </u>	132.53	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	67.96	x		0.76	x	0.7		·Ē	132.53	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	91.35	x		0.76	×	0.7		• [178.15	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	91.35	x		0.76	×	0.7		Ē	178.15	(75)
	_															_

Northeast _{0.9x}	0.77	7 x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7]	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]]	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] x	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7	=	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7] =	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Rooflights 0.9x	1	x	0.98	X	96	5	х	0.76	×	0.7		45.05	(82)
Rooflights 0.9x	1	x	3.37	X	15)	х	0.76	×	0.7		242.03	(82)
Rooflights 0.9x	1	X	1.13	= x	150)	х	0.76	×	0.7	=	81.16	(82)
Rooflights _{0.9x}	1	x	0.98	x ا	15)	Х	0.76	×	0.7	-	70.38	(82)
Rooflights _{0.9x}	1	x	3.37	×	19:	2	Х	0.76	×	0.7	-	309.8	(82)
Rooflights _{0.9x}	1	X	1.13	x	19:	2	x	0.76	×	0.7	_ =	103.88	(82)
Rooflights 0.9x	1	x	0.98	×	19:	2	х	0.76	x	0.7	=	90.09	(82)
Rooflights 0.9x	1	x	3.37	×	20)	х	0.76	×	0.7	=	322.71	(82)
Rooflights 0.9x	1	x	1.13	x	20)	х	0.76	x	0.7	<u> </u>	108.21	(82)
Rooflights 0.9x	1	x	0.98	×	20)	х	0.76	x	0.7	=	93.84	(82)
Rooflights 0.9x	1	x	3.37	×	18	9	х	0.76	×	0.7	=	304.96	(82)
Rooflights 0.9x	1	X	1.13	×	18	9	х	0.76	x	0.7	=	102.26	(82)
Rooflights _{0.9x}	1	x	0.98	= x	18	9	x	0.76	×	0.7		88.68	(82)
Rooflights _{0.9x}	1	X	3.37	×	15	7	х	0.76	×	0.7	_ =	253.33	(82)
Rooflights _{0.9x}	1	X	1.13	×	15	7	х	0.76	×	0.7	_ =	84.94	(82)
Rooflights _{0.9x}	1	x	0.98	= x	15	7	х	0.76	×	0.7	-	73.67	(82)
Rooflights _{0.9x}	1	x	3.37	= x	11:	5	х	0.76	×	0.7	-	185.56	(82)
Rooflights _{0.9x}	1	x	1.13	×	11:	5	Х	0.76	×	0.7	-	62.22	(82)
Rooflights 0.9x	1	X	0.98	٦ ×	11:	5	х	0.76	×	0.7	-	53.96	(82)
Rooflights _{0.9x}	1	x	3.37	×	66	3	х	0.76	×	0.7	= -	106.49	(82)
Rooflights _{0.9x}	1	X	1.13	×	66	3	х	0.76	×	0.7	-	35.71	(82)
Rooflights 0.9x	1	X	0.98	٦ ×	66	3	х	0.76	×	0.7	-	30.97	(82)
Rooflights 0.9x	1	X	3.37	= x	33	3	х	0.76	×	0.7	=	53.25	(82)
Rooflights 0.9x	1	x	1.13	×	33	3	х	0.76	×	0.7		17.85	(82)
Rooflights 0.9x	1	X	0.98	× ا	33	3	х	0.76	×	0.7		15.48	(82)
Rooflights _{0.9x}	1	x	3.37	×	21		Х	0.76	×	0.7	= =	33.88	(82)
Rooflights _{0.9x}	1	x	1.13	= x	21		Х	0.76	×	0.7		11.36	(82)
Rooflights 0.9x	1	x	0.98	d x	21		х	0.76	×	0.7	=	9.85	(82)
L				_									
Solar gains in	watts, ca	lculated	for each mo	nth			(83)m	= Sum(74)m .	(82)m	_		_	
(83)m= 386.5			1468.94 1775			729.37	1494	1.36 1201.89	802.5	2 470.83	325.54		(83)
Total gains – i			` 	<u> </u>								-	
(84)m= 876.04	1187.71	1531.71	1914.47 2194	.47 22	210.44 2	106.51	1877	7.94 1598.87	1225.	923.94	801.49]	(84)
7. Mean inter	nal temp	erature (heating seas	son)									
Temperature	during he	eating pe	eriods in the	living	area fro	m Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for ga	ins for li	ving area, h	1,m (s	ee Tabl	e 9a)						-	
Jan	Feb	Mar	Apr Ma	ay	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.93	0.8 0.6	1	0.44	0.32	0.3	7 0.62	0.9	0.98	1		(86)
Mean interna	l tempera	ature in li	iving area T1	(follo	w steps	3 to 7	' in T	able 9c)					
(87)m= 19.57	19.89	20.31	20.72 20.9	93 2	20.99	21	20.9	99 20.94	20.59	19.98	19.51]	(87)
Temperature	during he	eating pe	eriods in rest	of dw	velling fr	om Ta	ıble 9), Th2 (°C)				=	
(88)m= 20.28	20.28	20.29	20.29 20.2			20.3	20.		20.29	20.29	20.29]	(88)
		1	·							-		•	

Utilisation f	factor for o	ains for	rest of di	vellina k	n2 m (se	e Table	9a)						
(89)m= 0.99		0.92	0.78	0.57	0.39	0.27	0.32	0.57	0.88	0.98	0.99		(89)
Mean inter	nal temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	r in Tabl	e 9c)				
(90)m= 18.9		19.67	20.06	20.24	20.29	20.3	20.3	20.26	19.95	19.36	18.89		(90)
		<u> </u>				ļ		f	LA = Livin	g area ÷ (4	1) =	0.33	(91)
Mean inter	nal tampai	atura (fo	or the wh	ole dwel	ling) – fl	Δ √ Τ1	⊥ /1 _ fl	Δ) ~ T2			L		_
(92)m= 19.1		19.88	20.28	20.46	20.52	20.53	20.52	20.48	20.16	19.56	19.09		(92)
Apply adju	 stment to t	ı he mear	ı internal	tempera	ature fro	ı m Table	4e. whe	re appro	L opriate				, ,
(93)m= 19.7		20.48	20.88	21.06	21.12	21.13	21.12	21.08	20.76	20.16	19.69		(93)
8. Space h	eating req	uirement											
Set Ti to th			•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation t	factor for g	ains, hm				<u> </u>		<u> </u>					
(94)m= 0.99	0.97	0.92	0.8	0.62	0.44	0.33	0.38	0.63	0.9	0.98	0.99		(94)
Useful gair	ns, hmGm	, W = (94	4)m x (84	4)m									
(95)m= 868.3	39 1155.11	1411.04	1525.21	1352.42	979.86	689.11	715.1	1000.23	1097.36	905.9	796.5		(95)
Monthly av	erage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss r			 -			-``		<u> </u>			1		(a=)
(97)m= 2421.		l .	1852.59		998.03	693.02	722.41		1568.51		2409.46		(97)
Space hea	ting require 36 817.88	ement fo	235.71		Wh/mont 0	i e)m – (95 0)m] x (4 ² 350.53	1)m 804.73	1200.04		
(98)m= 1155.	36 817.88	5/4.12	235.71	69.27	U	0	0 Tata						7(00)
Space hea	tina requir	oment in	k\\/h/m²	lyoar			Tota	i per year	(kWh/year) = Sum(9	0)15,912 =	5207.65	(98) (99)
·				•							l	47.68	
9a. Energy		nts – Indi	ividual he	eating sy	/stems i	ncluding	micro-C	HP)					
Space hea Fraction of	_	at from s	econdar	//supple	mentary	system					[0	(201)
Fraction of	•		•		montary	•	(202) = 1 -	- (201) =			[[1	(202)
Fraction of	•		-	` '			, ,	02) × [1 – ((203)] =		l		(204)
		Ū	•				(204) - (20	02) X [1	(200)] =		<u>[</u>	1	╡`
Efficiency	•		0 ,		a ovetom	. 0/						85.4	(206)
Efficiency of	Ji Seconda					I. 70						0	
la	- Fab	· · ·	· · · ·				A	Con	0.4	Nov	Daa	14\A/b /	
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space hea	ting require	Mar ement (c	Apr alculated	May d above)	Jun	Jul						kWh/ye	
Space hea	ting require 36 817.88	Mar ement (c	Apr calculated	May d above)	Jun		Aug 0	Sep 0	Oct 350.53	Nov 804.73	Dec 1200.04	kWh/ye	ar
Space hea 1155. (211)m = {[(ting require 36 817.88 98)m x (20	Mar ement (c 574.12 (4)] } x 1	Apr calculated 235.71 00 ÷ (20	May d above) 69.27	Jun 0	Jul 0	0	0	350.53	804.73	1200.04	kWh/ye	
Space hea	ting require 36 817.88 98)m x (20	Mar ement (c	Apr calculated	May d above)	Jun	Jul	0	0	350.53 410.46	804.73 942.31	1200.04		(211)
Space hea 1155. (211)m = {[(ting require 36 817.88 98)m x (20 88 957.7	Mar ement (c 574.12 04)] } x 1 672.27	Apr calculated 235.71 00 ÷ (20 276.01	May d above) 69.27 (6) 81.11	Jun 0	Jul 0	0	0	350.53	804.73 942.31	1200.04	kWh/ye	ar
Space hea 1155. (211)m = {[(1352.	ting require 36 817.88 98)m x (20 88 957.7 ting fuel (s	Mar ement (c 574.12 (4)] } x 1 672.27	Apr 235.71 200 ÷ (20 276.01 27), kWh//	May d above) 69.27 (6) 81.11	Jun 0	Jul 0	0	0	350.53 410.46	804.73 942.31	1200.04		(211)
Space hea 1155. (211)m = {[(1352.	ting require 36 817.88 98)m x (20 88 957.7 ting fuel (s	Mar ement (c 574.12 (4)] } x 1 672.27	Apr 235.71 200 ÷ (20 276.01 27), kWh//	May d above) 69.27 (6) 81.11	Jun 0	Jul 0	0	0	350.53 410.46	804.73 942.31	1200.04		(211)
Space hea 1155. (211)m = {[(1352. Space hea = {[(98)m x	ting require 36 817.88 98)m x (20 88 957.7 ting fuel (s (201)] } x 1	Mar ement (c 574.12 (4)] } x 1 672.27 econdar 00 ÷ (20	Apr 235.71 235.71 276.01 276.01 29), kWh/98)	May d above) 69.27 (6) 81.11 month	Jun 0	Jul 0	0 Tota	0 0 I (kWh/yea	350.53 410.46 ar) =Sum(2	942.31 211) _{15,1012}	1200.04		(211)

Water heating								
Output from water heater (calculated above) 214.2 188.76 198.15 177.5 173.86 1	55.22 148	.95 163.61	163.38	184.07	194.79	209	1	
Efficiency of water heater	ļ .					l	75.3	(216)
(217)m= 87.65 87.12 85.98 83.23 79.06	75.3 75	3 75.3	75.3	84.56	87	87.79		(217)
Fuel for water heating, kWh/month						-		
(219) m = (64) m x $100 \div (217)$ m (219)m = 244.38 216.66 230.47 213.27 219.9 2	206.13 197	.81 217.28	216.97	217.67	223.89	238.08]	
	Į	Tota	ıl = Sum(2	19a) ₁₁₂ =		<u> </u>	2642.5	(219)
Annual totals				k\	Wh/year	•	kWh/year	⊿ _
Space heating fuel used, main system 1							6097.95	
Water heating fuel used							2642.5	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						39		(230c)
boiler with a fan-assisted flue						45]	(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			84	(231)
Electricity for lighting							425.75	(232)
12a. CO2 emissions – Individual heating system	ıs including	micro-CHF)					
	Energy kWh/ye			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	1317.16	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(210) v							(264)
	(219) x			0.2	16	=	570.78	(=0 .)
Space and water heating	, ,	62) + (263) +	(264) =	0.2	16	=	570.78 1887.94	(265)
Space and water heating Electricity for pumps, fans and electric keep-hot	, ,	62) + (263) +	(264) =	0.5		=		_
•	(261) + (2	62) + (263) +	(264) =		19		1887.94	(265)
Electricity for pumps, fans and electric keep-hot	(261) + (2 (231) x	62) + (263) +	,	0.5	19	=	1887.94	(265)

El rating (section 14)

(274)

		User Details:			
Assessor Name: Software Name:	Su Lee Stroma FSAP 2012	Stroma Nun Software Ve		O031315 ion: 1.0.4.16	
Adduses		roperty Address: Unit 0			
Address: 1. Overall dwelling dime	138-140 Highgate Road, Hig	gngate, Highgate, NVV5	TPB		
1. Overall dwelling dime	511310113.	Area(m²)	Av. Height(m)	Volume(m	3)
Basement		38.62 (1a) x	2.7 (2a) =		(3a)
Ground floor		34.58 (1b) x	3.2 (2b) =	110.66	(3b)
First floor		31.61 (1c) x	4.65 (2c) =	146.99	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1r	1) 104.81 (4)			
Dwelling volume		(3a)+(3	b)+(3c)+(3d)+(3e)+(3n) =	361.92	(5)
2. Ventilation rate:					
	main secondar heating heating	y other	total	m³ per hoι	ır
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ns		5 x 10 =	50	(7a)
Number of passive vents	3		0 x 10 =	0	(7b)
Number of flueless gas f	ires	[0 x 40 =	0	(7c)
			Air	changes per he	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7	(a)+(7b)+(7c) =	50 ÷ (5) =	0.14	(8)
	peen carried out or is intended, proceed	d to (17), otherwise continue			
Number of storeys in t	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0.1 =	0	(10)
	2.25 for steel or timber frame or resent, use the value corresponding to	•	truction	0	(11)
= -	floor, enter 0.2 (unsealed) or 0.	1 (sealed), else enter 0		0	(12)
If no draught lobby, en	,	, ,,		0	(13)
•	s and doors draught stripped			0	(14)
Window infiltration	5	0.25 - [0.2 x (14) ÷	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + ((12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metre	s per hour per square n	netre of envelope area	4	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + (8)$	3), otherwise (18) = (16)		0.34	(18)
Air permeability value applie	es if a pressurisation test has been don	e or a degree air permeability	is being used		
Number of sides sheltered	ed			1	(19)
Shelter factor		$(20) = 1 - [0.075 \times 0.000]$	(19)] =	0.92	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18) x (20) =		0.31	(21)
Infiltration rate modified t	for monthly wind speed			_	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec	;	
Monthly average wind sp	peed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>				
Adjusted infiltra		· · · · · ·				. 	`	`´	I 0.04	0.05	0.07		
0.4 Calculate effec	0.39 ctive air	0.38 change	0.34 rate for t	0.34 he appli	0.3 cable ca	0.3 SE	0.29	0.31	0.34	0.35	0.37		
If mechanica		-		upp	- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1	l – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		ı	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		<u> </u>	· `	``	<u> </u>	· ` `	ŕ		· ` ·	i e		ı	(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(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		(24d)
Effective air						<u> </u>	<u> </u>						
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
			•				•					l	
3 Heat Insses	s and he	at loss i	naramete	or.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value	<u>.</u>	AXk
3. Heat losses		SS	paramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				<)			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 4.86	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.46 4.86 5.01	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.64	<) 			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.64 1.86	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.64 1.86 6.44	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.64 1.86 6.44 6.75	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 e 1	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	es (m²)	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	5 (m²)	Openin m	gs ₁ ²	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62 10.15	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206 1.52 4.01				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	55 (m²)	Openin m	gs ₁ ²	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62 10.15 26.7 0.22	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206 1.52 4.01 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	55 (m²)	Openin m	gs ₁₂	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62 10.15	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206 1.52 4.01				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6	6.02	2	5.09		0.93	x	0.15	=	0.14				(29)
Walls Type7	0.8		1.4		-0.6	x	0.15	=	-0.09			7 -	(29)
Walls Type8	0.90	6	0		0.96	x	0.15	=	0.14				(29)
Walls Type9	5.28	8	0		5.28	x	0.15	=	0.79				(29)
Walls Type10	5		0		5	x	0.15	=	0.75				(29)
Walls Type11	5.70	6	4.86		0.9	x	0.15	=	0.14				(29)
Walls Type12	0.42	2	0		0.42	x	0.15	=	0.06				(29)
Walls Type13	6.18	В	0		6.18	X	0.15	=	0.93				(29)
Walls Type14	8.74	4	5.09		3.65	X	0.15	=	0.55				(29)
Walls Type15	1.80	6	0		1.86	X	0.15	=	0.28				(29)
Walls Type16	8.6	i	2.46		6.14	X	0.15	=	0.92				(29)
Walls Type17	40		0		40	X	0.15	=	6				(29)
Walls Type18	8.9	7	0		8.97	X	0.15	=	1.35				(29)
Walls Type19	0.6	;	0		0.6	X	0.15	=	0.09				(29)
Walls Type20	8.3	7	4.86		3.51	X	0.15	=	0.53				(29)
Roof Type1	31.1	4	4.5		26.64	x	0.13	=	3.46				(30)
Roof Type2	2.3	8	0.98		1.4	x	0.13	=	0.18				(30)
Total area of e	lements	, m²			227.9	8							(31)
Party wall					29.19) x	0	=	0				(32)
Party wall					32.58	x	0	=	0				(32)
Party wall					38.73	3 x	0	=	0				(32)
* for windows and ** include the area						ated using	g formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragraph	3.2	
Fabric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =			[79.03	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	= Cm ÷	- TFA) ir	n kJ/m²K			Indica	ative Value	: Medium		250	(35)
For design assess				construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge				ısina Ar	pendix k	<					ſ	15.38	(36)
if details of therma	,	,		• .	•	•					l	10.00	(00)
Total fabric he	at loss							(33) +	- (36) =		[94.41	(37)
Ventilation hea	t loss ca	alculated	monthly	/		•		(38)m	n = 0.33 × ((25)m x (5)) 		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 69.21	68.85	68.48	66.79	66.47	64.99	64.99	64.72	65.56	66.47	67.11	67.78		(38)
Heat transfer of		·					_		n = (37) + (37)				
(39)m= 163.62	163.25	162.89	161.19	160.87	159.39	159.39	159.12	159.96	160.87	161.52	162.19		— (20)
Heat loss para	meter (H	HLP), W	/m²K						Average = n = (39)m ÷		12 /12=	161.19	(39)
(40)m= 1.56	1.56	1.55	1.54	1.53	1.52	1.52	1.52	1.53	1.53	1.54	1.55		
NI or C. C.		. d. / T !	- -						Average =	Sum(40) ₁	12 /12=	1.54	(40)
Number of day	's in moi	nth (Tab	ie 1a)				1 .		-				

Mar

Apr

May

31

Jun

30

Jul

31

Aug

31

Sep

Oct

Nov

30

Dec

31

Feb

28

Jan

(41)m =

(41)

4. Water heating e	nerav reau	irement:								kWh/ye	ear:			
Assumed occupancy if TFA > 13.9, N = if TFA £ 13.9, N =	1 + 1.76 >	([1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		.78		(42)		
Annual average hot Reduce the annual avera not more that 125 litres p	ge hot water	usage by	5% if the c	lwelling is	designed			se target o		0.22		(43)		
			1	1		Ι	0	0-4	N.					
Jan Fe		Apr ach month	May Vd.m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec				
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.24 106.23 102.23 98.22 94.21 90.2 90.2 94.21 98.22 102.23 106.23 110.24 Total = Sum(44) ₁₁₂ = 1202.65 (44)														
(44)///= 110.24 100.2	3 102.23	90.22	34.21	90.2	90.2	34.21			L	!	1202 65	(44)		
Energy content of hot wa	ter used - ca	lculated m	onthly = 4.	190 x Vd,ı	m x nm x E	OTm / 3600			. ,	L	1202.00	()		
(45)m= 163.49 142.9	9 147.55	128.64	123.43	106.51	98.7	113.26	114.61	133.57	145.8	158.33		_		
If instantaneous water he	ating at poin	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	= [1576.86	(45)		
(46)m= 24.52 21.4	5 22.13	19.3	18.51	15.98	14.8	16.99	17.19	20.04	21.87	23.75		(46)		
Water storage loss:		-	I.	!			l							
Storage volume (litre	,				_		ame ves	sel		210		(47)		
If community heating			_			` '		(01.1						
Otherwise if no store Water storage loss:	ed hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er 'O' in (47)					
a) If manufacturer's	declared	loss fact	or is kno	wn (kWl	n/dav):				1	.57		(48)		
Temperature factor				(, , .					.54		(49)		
Energy lost from wa			ear			(48) x (49)) =			.85		(50)		
b) If manufacturer's	•	-		or is not		(10)11(10)	,		0.	.00		(00)		
Hot water storage lo			le 2 (kW	h/litre/da	ay)					0		(51)		
If community heating	•	on 4.3										(==)		
Volume factor from Temperature factor		2h							-	0		(52)		
·						(47) (54)) (50) (F0\		0		(53)		
Energy lost from wa Enter (50) or (54) ir	_	e, Kvvn/y	ear			(47) x (51)) X (52) X (53) =	-	0		(54) (55)		
, , , , ,	` ,	for oach	month			((56)m = (55\ v (41\	m	0.	.85		(55)		
Water storage loss of		1	1	1				ı				(50)		
(56)m= 26.28 23.79 If cylinder contains dedic		25.43	26.28 m = (56)m	25.43	26.28	26.28	25.43	26.28	25.43	26.28	√ ⊔	(56)		
		1			· · ·		, , ,	· ·			X 1 1	(57)		
(57)m= 26.28 23.7	26.28	25.43	26.28	25.43	26.28	26.28	25.43	26.28	25.43	26.28		(57)		
Primary circuit loss	annual) fr	om Table	e 3							0		(58)		
Primary circuit loss			,			, ,								
(modified by facto					1	Ť	<u> </u>					(50)		
(59)m= 23.26 21.0	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)		
Combi loss calculate	d for each	month	(61)m =	(60) ÷ 30	65 × (41)m								
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)		
Total heat required t	or water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	า		
(62)m= 213.03 187.7	4 197.09	176.58	172.97	154.46	148.24	162.8	162.56	183.11	193.74	207.87		(62)		
Solar DHW input calculate	ed using App	endix G o	Appendix	H (negati	ve quantity	y) (enter '0	if no sola	r contribut	ion to wate	er heating)				
(add additional lines	if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)							
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)		
											_			

Outrout from water hand												
Output from water heat (64)m= 213.03 187.74	er _{197.09}	176.58	172.97	154.46	148.24	162	2.8 162.5	56 183.	11 193.74	207.87	1	
(04)///= 213.03 167.74	197.09	176.56	172.97	134.40	140.24	<u> </u>			ater (annual)		2160.2	(64)
Heat gains from water I	heating	k\Mh/mo	nth () 25	5 ′ [O 8	5 v (15)m		•		,			(0.)
(65)m= 93.99 83.34	88.7	81.13	80.68	73.77	72.45	77.				92.28]	(65)
include (57)m in calc										1] posting	()
5. Internal gains (see		. ,		yılı lü c i		uwen	iiig oi 110	ı waleri	s ilolli coli	iiiiuiiity i	leating	
Metabolic gains (Table		· ·										
Jan Feb	Mar	Apr	May	Jun	Jul	Α	ug Se	рОо	t Nov	Dec]	
(66)m= 138.99 138.99	138.99	138.99	138.99	138.99	+	138				138.99		(66)
Lighting gains (calculat			. equati						<u>!</u>	1	J	
(67)m= 23.52 20.89	16.99	12.86	9.62	8.12	8.77	11			3 22.68	24.18]	(67)
Appliances gains (calcu	ulated in	Appendi	x L, equ	uation	L13 or L1	3a),	also see	Table 5	!			
(68)m= 263.88 266.62	259.72	245.03	226.48	209.05	197.41	194	.67 201.5	57 216.	26 234.81	252.23]	(68)
Cooking gains (calculat	ted in Ap	pendix L	., equat	ion L1	or L15a), als	o see Tal	ble 5	•	•	•	
(69)m= 36.9 36.9	36.9	36.9	36.9	36.9	36.9	36	.9 36.9	36.	36.9	36.9]	(69)
Pumps and fans gains	(Table 5	a)	•		•					•	•	
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporation	n (negati	ive value	s) (Tab	le 5)			-	-	-	-	-	
(71)m= -111.19 -111.19	-111.19	-111.19	-111.19	-111.19	-111.19	-111	.19 -111.	19 -111.	19 -111.19	-111.19		(71)
Water heating gains (Ta	able 5)											
(72)m= 126.34 124.02	119.21	112.68	108.44	102.46	97.38	103	.89 106.	2 112.	97 120.6	124.03]	(72)
Total internal gains =				(6	6)m + (67)n	า + (68	3)m + (69)m	+ (70)m	+ (71)m + (72	2)m	_	
(73)m= 481.44 479.23	463.62	438.27	412.23	387.33	371.26	377	.66 390.7	78 416.	36 445.79	468.14		(73)
6. Solar gains:												
Solar gains are calculated u	_		Table 6a a			ations		o the appl		ation.	0-1	
Orientation: Access Fa Table 6d	actor	Area m²			ux able 6a		g_ Table 6	6b	FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	Х	5.09)	x	11.28	X	0.76	х	0.7	=	21.17	(75)
Northeast 0.9x 0.77	X	5.09)	x	11.28	X	0.76	х	0.7	=	21.17	(75)
Northeast _{0.9x} 0.77	X	5.09)	x	22.97	X	0.76	х	0.7	=	43.1	(75)
Northeast 0.9x 0.77	X	5.09)	x	22.97	X	0.76	X	0.7	=	43.1	(75)
Northeast 0.9x 0.77	X	5.09)	x	41.38	X	0.76	Х	0.7	=	77.65	(75)
Northeast 0.9x 0.77	X	5.09)	X	41.38	X	0.76	X	0.7	=	77.65	(75)
Northeast 0.9x 0.77	Х	5.09)	x	67.96	X	0.76	Х	0.7	=	127.52	(75)
Northeast 0.9x 0.77	Х	5.09)	x	67.96	X	0.76	Х	0.7	=	127.52	(75)
Northeast 0.9x 0.77	х	5.09)	х	91.35	x	0.76	х	0.7	=	171.42	(75)
Northeast 0.9x 0.77	х	5.09)	х	91.35	x	0.76	х	0.7	=	171.42	(75)
Northeast 0.9x 0.77	Х	5.09)	x	97.38	X	0.76	х	0.7	=	182.75	(75)

Northeast 0.9x

Northeast _{0.9x}	0.77) x	F 00	l x	01.1] _x	0.76	X	0.7	1 =	170.06	(75)
Northeast 0.9x	0.77	J 1	5.09]]	91.1]]	0.76	! !] 1	170.96	(75)
Northeast 0.9x	0.77] x] ,	5.09	l x l v	91.1	X	0.76	X	0.7] = 1 _	170.96	(75)
Northeast 0.9x	0.77] x] x	5.09	x x	72.63] x] x	0.76	X	0.7] =] =	136.29	(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] _x	72.63 50.42] ^] x	0.76	^ x	0.7]	136.29 94.62	(75)
Northeast 0.9x] ^] x] ^] x] ^] x		^ x]		(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] x	28.07] ^] x	0.76	^ x	0.7]	94.62 52.67	(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] x	28.07] ^] _x	0.76	x	0.7]	52.67	(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] _x	14.2] ^] x	0.76	^ x	0.7] -] =	26.64	(75)
Northeast 0.9x	0.77]	5.09] ^] x	14.2] ^] x	0.76	X	0.7] =	26.64	(75)
Northeast 0.9x	0.77]	5.09	l ^ l x	9.21] ^] _x	0.76	×	0.7]	17.29	(75)
Northeast _{0.9x}	0.77]	5.09] ^] x	9.21] ^] _x	0.76	x	0.7]	17.29	(75)
Southwest _{0.9x}	0.77] x	4.86] ^] _x	36.79] ^]	0.76	X	0.7]] ₌	65.93	(79)
Southwest _{0.9x}	0.77] x	5.01] ^] _X	36.79]]	0.76	x	0.7]] ₌	67.96	(79)
Southwest _{0.9x}	0.77] x	4.86] x	36.79]]	0.76	X	0.7]] ₌	65.93	(79)
Southwest _{0.9x}	0.77]]	4.86] x	36.79]]	0.76	X	0.7]] ₌	65.93	(79)
Southwest _{0.9x}	0.77] x	4.86) x	62.67]]	0.76	x	0.7]] _	112.3	(79)
Southwest _{0.9x}	0.77]]	5.01]]	62.67]]	0.76	X	0.7]] ₌	115.76	(79)
Southwest _{0.9x}	0.77]]	4.86) x	62.67]]	0.76	X	0.7]] _	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	l X	62.67	<u> </u> 	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	X	85.75	<u>.</u>]	0.76	X	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77) x	5.01	X	85.75	i	0.76	X	0.7	j =	158.39	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	X	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	х	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25	j	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	X	5.01	×	106.25	ĺ	0.76	х	0.7	j =	196.25	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	j	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	j	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01	ĺ	0.76	x	0.7	j =	213.24	(79)
Southwest _{0.9x}	0.77	x	5.01	x	119.01	ĺ	0.76	x	0.7	<u> </u>	219.82	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7] =	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	X	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.01	x	118.15]	0.76	x	0.7	=	218.23	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.01	x	113.91]	0.76	x	0.7] =	210.4	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7] =	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7] =	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	x	104.39]	0.76	x	0.7] =	187.04	(79)

Southwest _{0.9x}		٦	5.04	1 .,	104.00	1	0.70	l		1	400.00	7(70)
Southwest _{0.9x}	0.77	X	5.01	X	104.39] 1	0.76	X	0.7] = 1	192.82	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	4.86] X	104.39] 1	0.76	X	0.7] =	187.04	(79)
Southwesto.gx	0.77	X	4.86] X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	5.01	X	92.85]	0.76	X	0.7] =	171.5	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	5.01	X	69.27]	0.76	Х	0.7	=	127.94	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	ļ	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	_	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.01	X	44.07]	0.76	X	0.7	=	81.4	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.01	X	31.49		0.76	X	0.7	=	58.16	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	X	11.28	X	0.76	X	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	X	22.97	X	0.76	X	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	X	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	X	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	X	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	X	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	X	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	X	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest _{0.9x}	0.77	X	1.4	X	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	X	28.07	x	0.76	X	0.7	=	14.49	(81)
Northwest 0.9x	0.77	X	1.4	X	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest _{0.9x}	0.77	X	1.4	X	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	X	26	X	0.76	X	0.7	=	41.95	(82)
Rooflights 0.9x	1	X	1.13	X	26	x	0.76	x	0.7	=	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	X	26	x	0.76	x	0.7	=	12.2	(82)
Rooflights _{0.9x}	1	X	3.37	x	54	x	0.76	x	0.7	=	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	j =	29.22	(82)
Rooflights _{0.9x}	1	X	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights 0.9x	1	X	3.37	X	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	x	1.13	x	96	x	0.76	х	0.7	j =	51.94	(82)
Rooflights _{0.9x}	1	X	0.98	X	96	x	0.76	x	0.7	=	45.05	(82)
Rooflights _{0.9x}	1	X	3.37	X	150	x	0.76	X	0.7	=	242.03	(82)
L		_						•		•		_

5 m								,			_					_
Rooflights 0.9x	1	×	1.1	3	X	1	50	X		0.76	X	0.7		=	81.16	(82)
Rooflights 0.9x	1	X	0.9	8	X	1	50	X		0.76	X	0.7		=	70.38	(82)
Rooflights 0.9x	1	×	3.3	37	X	1	92	X		0.76	X	0.7		=	309.8	(82)
Rooflights 0.9x	1	X	1.1	3	X	1	92	X		0.76	X	0.7		=	103.88	(82)
Rooflights 0.9x	1	X	0.9	8	X	1	92	X		0.76	X	0.7		=	90.09	(82)
Rooflights _{0.9x}	1	x	3.3	37	x	2	00	X		0.76	X	0.7		=	322.71	(82)
Rooflights 0.9x	1	x	1.1	3	x	2	00	x		0.76	X	0.7		=	108.21	(82)
Rooflights 0.9x	1	x	0.9	8	X	2	00	x		0.76	X	0.7		=	93.84	(82)
Rooflights 0.9x	1	x	3.3	37	X	1	89	х		0.76	X	0.7		=	304.96	(82)
Rooflights 0.9x	1	x	1.1	3	X	1	89	x		0.76	X	0.7		=	102.26	(82)
Rooflights 0.9x	1	x	0.9	8	x	1	89	x		0.76	x	0.7		=	88.68	(82)
Rooflights 0.9x	1	x	3.3	37	x	1	57	X		0.76	x	0.7	司	=	253.33	(82)
Rooflights 0.9x	1	×	1.1	3	x	1	57	j×		0.76	X	0.7		=	84.94	(82)
Rooflights _{0.9x}	1	х	0.9)8	x	1	57	j x		0.76	x	0.7		=	73.67	(82)
Rooflights 0.9x	1	X	3.3	37	x	1	15	x		0.76	x	0.7		=	185.56	(82)
Rooflights 0.9x	1	x	1.1	3	X	1	15	X		0.76	X	0.7	\equiv	=	62.22	(82)
Rooflights 0.9x	1	x	0.9)8	X	1	15	X		0.76	X	0.7		=	53.96	(82)
Rooflights 0.9x	1	×	3.3	37	x		66	X		0.76	X	0.7	一	=	106.49	(82)
Rooflights 0.9x	1	×	1.1	3	x		66	j x		0.76	d x	0.7	一	=	35.71	(82)
Rooflights 0.9x	1	X	0.9		x		66	X		0.76	X	0.7		=	30.97	(82)
Rooflights 0.9x	1	X	3.3		x		33]]		0.76	d x	0.7	〓	=	53.25	(82)
Rooflights _{0.9x}	<u>·</u> 1	x	1.1		X		33]]		0.76	d x	0.7	_	_	17.85	(82)
Rooflights _{0.9x}	<u>·</u> 1	X	0.9		X		33] x		0.76	X	0.7	_	_	15.48	(82)
Rooflights _{0.9x}	<u>'</u> 1	x	3.3		X		21]		0.76	_ ^ x	0.7	\dashv	_	33.88	(82)
Rooflights 0.9x	1	x	1.1		X		21] ^] x		0.76	^ x	0.7	\dashv	_	11.36	(82)
Rooflights _{0.9x}	<u>'</u> 1	x	0.9		X		21] ^] x		0.76	^ x	0.7	_	_	9.85	(82)
3 4 0.0x		^	0.8	,0	^		<u> </u>	」 ^		0.70	_ ^	0.7			9.03	
Solar gains in	watte ca	alculated	for eac	h mont	h			(83)n	n – Su	ım(74)m	(82)m					
(83)m= 382.13	692.39	1047.88				93.85	1707.53		-	1187.61	793.2		321.	.85		(83)
Total gains – ii	nternal a	nd solar	(84)m =	- (73)m	+ (8	83)m ,	watts					<u> </u>				
(84)m= 863.56	1171.62	1511.5	1889.35	2165.5	2 21	81.18	2078.8	185	3.61	1578.39	1209.	63 911.28	79	0		(84)
7. Mean inter	nal temn	erature (heating	28320	n)				!				<u>!</u>			
Temperature						area fi	om Tal	hla 0	Th1	l (°C)					21	(85)
Utilisation fac	_	•			_			DIC J	,	(0)					21	
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	ΙΔ	ug	Sep	Oc	t Nov	D	ec		
(86)m= 0.99	0.98	0.93	0.81	0.63	_	0.46	0.33	0.3		0.64	0.91		0.9			(86)
,	l I	Į.				!		<u> </u>		!	0.01	0.00	0.0	•		()
Mean interna	· ·	-			_	 i		_	$\overline{}$	' 1	00.5	10.07	100	20	1	(07)
(87)m= 19.44	19.76	20.2	20.65	20.9		20.98	21	20.	.99	20.92	20.5	19.87	19.3	38		(87)
Temperature					$\overline{}$			able	9, Th	12 (°C)			•		Ī	
(88)m= 20.22	20.22	20.22	20.23	20.23	2	20.24	20.24	20.	.24	20.24	20.2	3 20.23	20.2	23		(88)
Utilisation fac	tor for ga	ains for r	est of d	welling	, h2,	,m (se	e Table	9a)								
(89)m= 0.99	0.97	0.92	0.79	0.59		0.41	0.28	0.0	33	0.58	0.89	0.98	0.9	9		(89)

90)m=	miconnai	temper	ature iii i	ne rest	or aweiii	ng 12 (to	ollow ste	ps 3 to	n rabi	e 9c)		_		
- III	18.76	19.09	19.52	19.95	20.16	20.23	20.24	20.24	20.19	19.83	19.2	18.71		(90)
!									f	LA = Livin	g area ÷ (4	4) =	0.32	(91
						\			4) ===			Į		
			ature (fo					<u> </u>						(00
92)m=	18.98	19.3	19.74	20.17	20.4	20.47	20.48	20.48	20.42	20.05	19.42	18.93		(92)
Apply	adjustm	ent to the	ne mean	internal	temper	ature fro	m Table	4e, whe	re appro	priate	•	•		
93)m=	19.58	19.9	20.34	20.77	21	21.07	21.08	21.08	21.02	20.65	20.02	19.53		(93)
8. Spa	ace heat	ting requ	uirement											
			ernal ten or gains u	•		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=	0.99	0.97	0.92	0.81	0.63	0.46	0.34	0.4	0.64	0.9	0.98	0.99		(94
	l nains	hmGm	W = (94	l)m x (84	 4)m									
95)m=		1138.11	1393.93			1004.37	708.2	733.59	1012.41	1085.84	892.37	784.43		(95
·							700.2	700.00	1012.41	1000.04	002.07	704.40		(
			rnal tem				40.0	40.4	444	40.0	7.4	4.0		(96
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		(90
			an intern				-``	-``	<u> </u>		1	1		
97)m=	l l		2254.38	1914.1	1495.5	1031.27	714.47	744.81	1107.57		l .	2485.84		(97
Space	e heating	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4 ²	1)m			
98)m=	1223.83	881.27	640.17	282.29	92.24	0	0	0	0	395.45	859.87	1265.85		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	5640.96	(98
Snace	e heating	n require	ement in	kWh/m²	/vear								53.82	<u> </u>
•	o modum,	<i>y</i>												
					•								33.02	
			nts – Indi		•	ystems i	ncluding	micro-C	CHP)				33.02	
Spac	e heatin	g:	nts – Indi	vidual h	eating sy		J	micro-C	CHP)					
Space	e heatin	g:		vidual h	eating sy		J	micro-C	CHP)				0	
Spac Fracti	e heatin on of sp	g: ace hea	nts – Indi	vidual h	eating sy		system	micro-C (202) = 1	, in the second					(20
Spac e Fracti Fracti	e heatin on of sp on of sp	g: ace hea ace hea	nts – Indi nt from se nt from m	vidual he econdary ain syst	eating sy y/supple em(s)		system	(202) = 1 -	, in the second	(203)] =			0	(20
Space Fracti Fracti Fracti	e heating on of sponsor on of sponsor on of total	g: ace hea ace hea al heatii	nts - Indi nt from se nt from m	vidual he econdary ain syst main sys	eating sy y/supple em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			0 1 1	(20)
Space Fracti Fracti Fracti Efficie	e heating on of sponsor on of sponsor of totel ency of realists.	g: ace hea ace hea al heatin	nts – Indi at from se at from m ag from r ace heati	vidual he econdary ain syst main sys ng syste	eating sy y/supple em(s) stem 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			0 1 1 85.4	(20)
Space Fracti Fracti Fracti Efficie	e heating on of sponsor on of sponsor of totel ency of realists.	g: ace hea ace hea al heatin	nts - Indi nt from se nt from m	vidual he econdary ain syst main sys ng syste	eating sy y/supple em(s) stem 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			0 1 1	(20 (20 (20 (20 (20
Space Fracti Fracti Fracti Efficie	e heating on of sponsor on of sponsor of totel ency of realists.	g: ace hea ace hea al heatin	nts – Indi at from se at from m ag from r ace heati	vidual he econdary ain syst main sys ng syste	eating sy y/supple em(s) stem 1	mentary	system	(202) = 1 -	- (201) =	(203)] =	Nov	Dec	0 1 1 85.4	(20 (20 (20 (20 (20
Space Fracti Fracti Fracti Efficie Efficie	e heating on of spon of totency of rency of senc	eg: ace hea ace hea al heatin nain spa econda Feb	nts – Indi at from se at from m ng from r ace heati ry/supple Mar	vidual he econdary ain syst main syst ng syste ementary	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Nov	Dec	0 1 1 85.4	(20 (20 (20 (20 (20
Space Fracti Fracti Fracti Efficie Efficie	e heating on of spon of totency of rency of senc	g: ace hea ace hea al heatin nain spa econda Feb	at from set trom ming from race heati	vidual he econdary ain syst main syst ng syste ementary	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Nov 859.87	Dec 1265.85	0 1 1 85.4	(20 (20 (20 (20 (20
Space Fracti Fracti Fracti Efficie Efficie Space	e heating on of spon of totency of rency of sp	ace hea ace hea al heatin nain spa seconda Feb g require	at from set from many from reace heating the many supplement (c. 640.17	econdary ain systemain systemain systementary Apralculated	eating sylv/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct			0 1 1 85.4	(20) (20) (20) (20) (20)
Space Fracti Fracti Fracti Efficie Efficie Space	e heating on of spon of totency of rency of sp	ace hea ace hea al heatin nain spa econda Feb g require 881.27	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (ca 640.17	econdary ain systemain systementary Apr alculated 282.29 00 ÷ (20	eating sylv/supple em(s) stem 1 em 1 May dabove) 92.24	mentary g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2	- (201) = 02) × [1 - (Oct 395.45	859.87	1265.85	0 1 1 85.4	(20) (20) (20) (20) (20)
Space Fracti Fracti Fracti Efficie Efficie Space	e heating on of spon of totency of rency of sp	ace hea ace hea al heatin nain spa econda Feb g require 881.27	at from set from many from reace heating the many supplement (c. 640.17	econdary ain systemain systemain systementary Apralculated	eating sylv/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 395.45 463.06	859.87	1265.85 1482.26	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Efficie Space	e heating on of spon of totency of rency of sp	ace hea ace hea al heatin nain spa econda Feb g require 881.27	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (ca 640.17	econdary ain systemain systementary Apr alculated 282.29 00 ÷ (20	eating sylv/supple em(s) stem 1 em 1 May dabove) 92.24	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 395.45 463.06	859.87	1265.85 1482.26	0 1 1 85.4	(20) (20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Space 211)m	e heating on of spon of tot ency of spon of spon of tot ency of spon on the ency of sp	ace hea ace hea al heatin nain spa seconda Feb g require 881.27 Im x (20 1031.93	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (ca 640.17	econdary ain systemain systemain systementary Apralculated 282.29 00 ÷ (20 330.55	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 92.24 06)	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 395.45 463.06	859.87	1265.85 1482.26	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Space 211)m	e heating on of spon of totency of rency of sp	ace hea ace hea al heatin nain spa seconda Feb g require 881.27 mm x (20 1031.93	at from set from many from reace heating the many from the	econdary ain systemain systemain systementary Apr alculated 282.29 00 ÷ (20 330.55	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 92.24 06)	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 395.45 463.06	859.87	1265.85 1482.26	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Space 211)m	e heating on of spon of tothercy of rency of spon of tothercy of spon on the s	ace hea ace hea al heatin nain spa seconda Feb g require 881.27 mm x (20 1031.93	at from set from many from reace heati ry/supplement (called 4)] } x 1 749.62	econdary ain systemain systemain systementary Apr alculated 282.29 00 ÷ (20 330.55	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 92.24 06)	mentary g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 395.45 463.06	859.87	1265.85 1482.26	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Space 211)m	e heating on of spon of tothercy of rency of spon of tothercy of spon on the s	ace hea ace hea al heatin nain spa seconda Feb g require 881.27 Im x (20 1031.93 g fuel (se 1)] } x 1	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (co 640.17 4)] } x 1 749.62 econdary 00 ÷ (20)	econdary ain systemain systemain systematary Apralculated 282.29 00 ÷ (20 330.55	eating sylv/supple em(s) stem 1 em 1 y heating May d above) 92.24 e6) 108.01	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 0 Sep 0 I (kWh/yea	Oct 395.45 463.06 ar) = Sum(2	859.87 1006.88 211) _{15,1012}	1265.85	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Efficie Space 211)m	e heating on of spon of totency of rency of spon of totency of spon on totency of spon on the spon on	ace hear ace hear al heatin spans secondar Feb grequire 881.27 am x (20 1031.93 green fuel (secondar)] } x 1	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (co 640.17 4)] } x 1 749.62 econdary 00 ÷ (20)	econdary ain systemain systemain systementary Apr alculated 282.29 00 ÷ (20 330.55	eating sylv/supple em(s) stem 1 em 1 y heating May d above) 92.24 e6) 108.01	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 0	Oct 395.45 463.06 ar) = Sum(2	859.87 1006.88 211) _{15,1012}	1265.85	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Efficie Space 211)m Space : {[(98 215)m=	e heating on of sp on of tot ency of rency of s Jan 1223.83 n = {[(98) 1433.06] e heating m x (20) heating	ace hear al heating nain spanseconda Feb grequire 881.27 Im x (20 1031.93) g fuel (set 1)] } x 1	nts – Indi at from se at from m ng from r ace heati ry/supple Mar ement (ca 640.17 4)] } x 1 749.62 econdary 00 ÷ (200	econdary ain systemain systematary Apr alculated 282.29 00 ÷ (20 330.55	eating sylv/supple em(s) stem 1 em 1 y heating May d above) 92.24 e6) 108.01	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 0	Oct 395.45 463.06 ar) = Sum(2	859.87 1006.88 211) _{15,1012}	1265.85	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (21)
Space Fracti Fracti Fracti Efficie Efficie Space 211)m Space {[(98) 215)m=	e heating on of sp on of tot ency of r ency of s Jan 1223.83 1 = {[(98) 1433.06} e heating m x (20) m x (20) heating from wa	ace hear ace hear al heating nain spansecondar Feb grequire 881.27 am x (20 1031.93 green fuel (set 1)] } x 1	ter (calculater)	econdary ain systemain systemain systementary Apr alculated 282.29 00 ÷ (20 330.55 //), kWh/ 8) 0	eating sylv/supple em(s) stem 1 em 1 y heating May d above) 92.24 e6) 108.01 month	g system Jun 0	system n, % Jul 0	(202) = 1 · (204) = (2	- (201) = 02) × [1 - (0) Sep 0 I (kWh/yea	Oct 395.45 463.06 ar) = Sum(2	859.87 1006.88 211) _{15,1012} 0	1265.85	0 1 1 85.4 0 kWh/ye	(20 (20 (20 (20 (20
Space Fracti Fracti Fracti Efficie Efficie Space 211)m Space {[(98 215)m=	e heating on of sp on of tot ency of rency of s Jan 1223.83 n = {[(98) 1433.06] e heating m x (20) heating	ace hear al heating nain spanseconda Feb grequire 881.27 Imm x (20 1031.93 In fuel (set 1)] } x 1 In fuel (set 1)] } x 1 In fuel (set 1)] } x 1	ter (calcut 197.09	econdary ain systemain systematary Apr alculated 282.29 00 ÷ (20 330.55	eating sylv/supple em(s) stem 1 em 1 y heating May d above) 92.24 e6) 108.01	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 0	Oct 395.45 463.06 ar) = Sum(2	859.87 1006.88 211) _{15,1012}	1265.85	0 1 1 85.4 0 kWh/ye	(20) (20) (20) (20) (21)

					_		_	_	
(217)m= 87.79 87.32 86.33 83.92 79.94	75.3	75.3	75.3	75.3	85	87.19	87.91		(217)
Fuel for water heating, kWh/month									
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 242.66 214.99 228.32 210.41 216.37	205.12	196.87	216.2	215.88	215.41	222.22	236.45		
		l	Tota	l = Sum(2	19a) ₁₁₂ =	l	l	2620.9	(219)
Annual totals					k'	Wh/yea	r	kWh/year	_
Space heating fuel used, main system 1								6605.35	
Water heating fuel used								2620.9]
Electricity for pumps, fans and electric keep-ho	t						'		_
central heating pump:							39		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a)	(230g) =			84	(231)
Electricity for lighting								415.46	(232)
12a. CO2 emissions – Individual heating syste	ems inclu	uding mi	cro-CHF)					
12a. CO2 emissions – Individual heating syste			cro-CHF)	Fmiss	ion fac	tor	Fmissions	
12a. CO2 emissions – Individual heating syste	En	uding mi ergy /h/year	cro-CHF		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
12a. CO2 emissions – Individual heating system Space heating (main system 1)	En kW	ergy	cro-CHF	•		2/kWh	tor =		
	En kW (21	ergy /h/year	cro-CHF		kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	En kW (21	ergy /h/year	cro-CHF		kg CO	2/kWh	=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	En kW (211 (218	ergy /h/year 1) x 5) x			0.2 0.5	2/kWh	= =	kg CO2/yea	(261) (263)
Space heating (main system 1) Space heating (secondary) Water heating	En kW (211 (218 (26)	ergy /h/year 1) x 5) x			0.2 0.5	2/kWh 16 19	= =	kg CO2/yea 1426.75 0 566.11	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	En kW (211 (218 (26)	ergy /h/year 1) x 5) x 9) x 1) + (262)			0.2 0.5 0.2	2/kWh 16 19 16	= = =	kg CO2/yea 1426.75 0 566.11 1992.87	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho	(21) (21) (21) (26) (23)	ergy /h/year 1) x 5) x 9) x 1) + (262)		(264) =	0.2 0.5 0.2	2/kWh 16 19 16 19 19	= = = =	kg CO2/yea 1426.75 0 566.11 1992.87 43.6	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting	(21) (21) (21) (26) (23)	ergy /h/year 1) x 5) x 9) x 1) + (262)		(264) = sum c	0.2 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = = =	kg CO2/yea 1426.75 0 566.11 1992.87 43.6 215.62	(261) (263) (264) (265) (267) (268)

II.4. Be Green

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		User Details:				
Assessor Name:	Su Lee	Stroma Nun	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Versio	n: 1.0.4.16	
	Pro	perty Address: Unit 0	1			
Address :	138-140 Highgate Road, High	igate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
Basement		Area(m²) 42.14 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)
Ground floor		36.79 (1b) x	3.2	(2b) =	117.73	(3b)
First floor		34.79 (1c) x	4.65	(2c) =	161.77	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	113.72 (4)				_
Dwelling volume		(3a)+(3h	o)+(3c)+(3d)+(3e)+	.(3n) =	393.28	(5)
2. Ventilation rate:				-		
	main secondary heating heating	other	total		m³ per hou	٢
Number of chimneys		+ 0 =	0 x 4	40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 2	20 =	0	(6b)
Number of intermittent fa	ns		5 x 1	10 =	50	(7a)
Number of passive vents			0 x 1	10 =	0	(7b)
Number of flueless gas fi	res		0 x 4	40 =	0	(7c)
				Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	50	÷ (5) =	0.13	(8)
If a pressurisation test has b	een carried out or is intended, proceed i	to (17), otherwise continue i	from (9) to (16)	_		_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				-1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0	•	ruction	L	0	(11)
if both types of wall are pa deducting areas of openir	resent, use the value corresponding to th nas): if equal user 0.35	he greater wall area (after				
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		Г	0	(12)
If no draught lobby, en	ter 0.05, else enter 0			Ī	0	(13)
Percentage of windows	s and doors draught stripped			Ì	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	Ì	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	Ī	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope	area	4	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		Ì	0.33	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used			_
Number of sides sheltere	ed				1	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =	[0.92	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =			0.3	(21)
Infiltration rate modified f	or monthly wind speed	· · · · · · · · · · · · · · · · · · ·				
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a) x 3.39	Wind Factor (2	22a)m =	(22)m ÷	4										
Calculate effective air change rate or the applicable case 0			ì í	ı	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Calculate effective air change rate or the applicable case 0	A divisted infiltr	otion rot	o (allowi	na for oh	alter on	ط بینامط م	naad\	(210) ×	(22a)m		ı			
Calculate affective air change rate for the applicable case If mechanical ventilation: 0 (23a)			<u> </u>					r `	` ´ 	0.33	n 34	0.36		
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) Color								0.20	0.0	0.55	0.04	0.50		
Balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23a)	If mechanica	al ventila	tion:										0	(23a)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) + 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
C4a)m	If balanced with	n heat reco	very: effic	iency in %	allowing for	or in-use fa	actor (from	Table 4h) =				0	(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·						<u> </u>	- 	í `	- 		— `	÷ 100]	
C44b)m=0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '											0		(24a)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· -	ı		ı				- ` ` - 	``	 	<u> </u>			(5.41.)
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										0	0	0		(24b)
C4e m	,					•				E (22h	. \			
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	<u> </u>	ı	<u> </u>	<u> </u>	<u> </u>	<u> </u>	· ·	ŕ	ŕ	· ` ·		0		(24c)
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m [24d)m [24d)m [24d)m [25d)m	()											U		(240)
C4d m 0.57 0.57 0.57 0.56 0.55 0.54 0.54 0.54 0.55 0.55 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.56 0.57 0.57 0.57 0.56 0.55 0.54 0.54 0.54 0.55 0.55 0.55 0.56										0.5]				
Case Case	<u> </u>			· `	_	<u> </u>					0.56	0.56		(24d)
3. Heat losses and heat loss parameter. ELEMENT Gross area (m²) Openings area (m²) Met Area A , m² W/m2K	Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
ELEMENT Gross area (m²) Openings m² Net Area A ,m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X k kJ/K Doors 2.46 x 1.4 = 3.444 (26) Windows Type 1 4.86 x1[1/(1.4) + 0.04] = 6.44 (27) Windows Type 2 5.19 x1[1/(1.4) + 0.04] = 6.88 (27) Windows Type 3 1.4 x1[1/(1.4) + 0.04] = 1.86 (27) Windows Type 4 4.86 x1[1/(1.4) + 0.04] = 9.78 (27) Windows Type 5 7.38 x1[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 2 5.08 4.86 0.22 x 0.15<	(25)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
ELEMENT Gross area (m²) Openings m² Net Area A ,m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X k kJ/K Doors 2.46 x 1.4 = 3.444 (26) Windows Type 1 4.86 x1[1/(1.4) + 0.04] = 6.44 (27) Windows Type 2 5.19 x1[1/(1.4) + 0.04] = 6.88 (27) Windows Type 3 1.4 x1[1/(1.4) + 0.04] = 1.86 (27) Windows Type 4 4.86 x1[1/(1.4) + 0.04] = 9.78 (27) Windows Type 5 7.38 x1[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 2 5.08 4.86 0.22 x 0.15<														
Doors 2.46 x 1.4 = 3.444 (26) Windows Type 1 4.86 x1/[1/(1.4) + 0.04] = 6.44 (27) Windows Type 2 5.19 x1/[1/(1.4) + 0.04] = 6.88 (27) Windows Type 3 1.4 x1/[1/(1.4) + 0.04] = 1.86 (27) Windows Type 4 4.86 x1/[1/(1.4) + 0.04] = 6.44 (27) Windows Type 5 7.38 x1/[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1/[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1/[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.01 1.89 (29) Walls Type 3 1.35 1.4 </td <td>3. Heat losse</td> <td>s and he</td> <td>eat loss r</td> <td>paramete</td> <td>er:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	3. Heat losse	s and he	eat loss r	paramete	er:									
Windows Type 1 4.86 x1/[1/(1.4)+0.04] = 6.44 (27) Windows Type 2 5.19 x1/[1/(1.4)+0.04] = 6.88 (27) Windows Type 3 1.4 x1/[1/(1.4)+0.04] = 1.86 (27) Windows Type 4 4.86 x1/[1/(1.4)+0.04] = 6.44 (27) Windows Type 5 7.38 x1/[1/(1.4)+0.04] = 9.78 (27) Windows Type 6 5.83 x1/[1/(1.4)+0.04] = 7.73 (27) Windows Type 7 3.36 x1/[1/(1.4)+0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4)+0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4)+0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4)+0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)		Gros	SS	Openin	gs						K)			
Windows Type 2 5.19 x1/[1/(1.4) + 0.04] = 6.88 (27) Windows Type 3 1.4 x1/[1/(1.4) + 0.04] = 1.86 (27) Windows Type 4 4.86 x1/[1/(1.4) + 0.04] = 6.44 (27) Windows Type 5 7.38 x1/[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1/[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1/[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 4.69 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.582 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.34 -0.05 x 0.15 = -0.01 (29)	ELEMENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	K	(W/I	K)			kJ/K
Windows Type 3 1.4 x1/[1/(1.4) + 0.04] = 1.86 (27) Windows Type 4 4.86 x1/[1/(1.4) + 0.04] = 6.44 (27) Windows Type 5 7.38 x1/[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1/[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1/[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 4.69 (27b) Rooflights Type 2 1.13 x1/[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	n² x	W/m2	K =	(W/I	K)			kJ/K (26)
Windows Type 4 4.86 x1/[1/(1.4) + 0.04] = 6.44 (27) Windows Type 5 7.38 x1/[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1/[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1/[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 4.69 (27b) Rooflights Type 2 1.13 x1/[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	ELEMENT Doors Windows Type	Gros area	SS	Openin	gs	A ,n 2.46 4.86	m ² x x x1/	W/m2 1.4 /[1/(1.4)+	= 0.04] =	(W/I 3.444 6.44	K)			kJ/K (26) (27)
Windows Type 5 7.38 x1/[1/(1.4) + 0.04] = 9.78 (27) Windows Type 6 5.83 x1/[1/(1.4) + 0.04] = 7.73 (27) Windows Type 7 3.36 x1/[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 4.69 (27b) Rooflights Type 2 1.13 x1/[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	Doors Windows Type Windows Type	Gros area e 1	SS	Openin	gs	A ,r 2.46 4.86 5.19	x 1/2 x 1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] =	(W/I 3.444 6.44 6.88	K)			kJ/K (26) (27) (27)
Windows Type 6 5.83 $x1/[1/(1.4) + 0.04] = 7.73$ (27) Windows Type 7 3.36 $x1/[1/(1.4) + 0.04] = 4.45$ (27) Windows Type 8 6.71 $x1/[1/(1.4) + 0.04] = 8.9$ (27) Rooflights Type 1 3.35 $x1/[1/(1.4) + 0.04] = 4.69$ (27b) Rooflights Type 2 1.13 $x1/[1/(1.4) + 0.04] = 1.582$ (27b) Rooflights Type 3 1.37 $x1/[1/(1.4) + 0.04] = 1.918$ (27b) Floor 42.14 x 0.13 $=$ 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 $=$ 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 $=$ 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 $=$ -0.01 (29)	Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4	x 1/2 x 1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.88 1.86	K)			kJ/K (26) (27) (27) (27)
Windows Type 7 3.36 x1/[1/(1.4) + 0.04] = 4.45 (27) Windows Type 8 6.71 x1/[1/(1.4) + 0.04] = 8.9 (27) Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 4.69 (27b) Rooflights Type 2 1.13 x1/[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86	x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.88 1.86 6.44	K)			kJ/K (26) (27) (27) (27) (27)
Windows Type 8 6.71 $x1/[1/(1.4) + 0.04] = 8.9$ (27) Rooflights Type 1 3.35 $x1/[1/(1.4) + 0.04] = 4.69$ $(27b)$ Rooflights Type 2 1.13 $x1/[1/(1.4) + 0.04] = 1.582$ $(27b)$ Rooflights Type 3 1.37 $x1/[1/(1.4) + 0.04] = 1.918$ $(27b)$ Floor 42.14 x 0.13 $=$ 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 $=$ 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 $=$ 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 $=$ -0.01 (29)	Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 3 4 4	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38	x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.88 1.86 6.44 9.78	K)			kJ/K (26) (27) (27) (27) (27) (27)
Rooflights Type 1 3.35 x1/[1/(1.4) + 0.04] = 4.69 (27b) Rooflights Type 2 1.13 x1/[1/(1.4) + 0.04] = 1.582 (27b) Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 4 4 5 6 6	SS	Openin	gs	A ,r 2.46 4.86 5.19 1.4 4.86 7.38 5.83	x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73	K)			kJ/K (26) (27) (27) (27) (27) (27) (27)
Rooflights Type 2 1.13 $x1/[1/(1.4) + 0.04]$ $=$ 1.582 (27b) Rooflights Type 3 1.37 $x1/[1/(1.4) + 0.04]$ $=$ 1.918 (27b) Floor 42.14 x 0.13 $=$ 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 $=$ 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 $=$ 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 $=$ -0.01 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 4 4 5 5 6 6 7	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Rooflights Type 3 1.37 x1/[1/(1.4) + 0.04] = 1.918 (27b) Floor 42.14 x 0.13 = 5.478199 (28) Walls Type 1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type 2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type 3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 8 8	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Floor	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 4 5 6 7 8 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Walls Type1 12.61 0 12.61 x 0.15 = 1.89 (29) Walls Type2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 8 8 6 1 6 2	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Walls Type2 5.08 4.86 0.22 x 0.15 = 0.03 (29) Walls Type3 1.35 1.4 -0.05 x 0.15 = -0.01 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 8 8 6 1 6 2	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Walls Type3 1.35 1.4 -0.05 × 0.15 = -0.01 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 8 8 6 1 6 2	SS	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ	Gros area 4 1 4 2 4 3 4 4 5 6 6 7 8 8 6 1 6 2 6 3	ss (m²)	Openin	gs	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13 42.14	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582 1.918				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Walls Type4 5.18 5.19 -0.01 x 0.15 = 0 (29)	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1	Gros area 1 1 2 2 3 3 4 4 5 5 6 6 7 6 8 6 1 6 2 6 3	ss (m²)	Openin m	gs ²	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13 1.37 42.14	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582 1.918 5.47819				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
	ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1 Walls Type2	Gros area 1 1 2 2 3 3 4 4 5 5 6 6 7 6 8 8 6 1 6 2 6 3 12.6 5.08	ss (m²)	Openin m	gs ²	A ,n 2.46 4.86 5.19 1.4 4.86 7.38 5.83 3.36 6.71 3.35 1.13 1.37 42.14 12.61 0.22	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.88 1.86 6.44 9.78 7.73 4.45 8.9 4.69 1.582 1.918 5.47819 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Walls Type5	14.63	0	14.63	x	0.15	=	2.19				(29)
Walls Type6	1.7	0	1.7	x	0.15	=	0.26		\Box [(29)
Walls Type7	13.5	0	13.5	X	0.15	=	2.03		\Box [(29)
Walls Type8	5.22	0	5.22	x	0.15	=	0.78		\Box [(29)
Walls Type9	5.76	4.86	0.9	x	0.15	=	0.14		\Box [(29)
Walls Type10	0.42	0	0.42	x	0.15	=	0.06		\Box [(29)
Walls Type11	6.18	0	6.18	X	0.15	=	0.93				(29)
Walls Type12	15.33	0	15.33	x	0.15	=	2.3		\Box [(29)
Walls Type13	2.02	0	2.02	x	0.15	=	0.3				(29)
Walls Type14	16	0	16	x	0.15] =	2.4		\Box [(29)
Walls Type15	11.53	6.71	4.82	x	0.15] =	0.72		\Box [(29)
Walls Type16	2	0	2	x	0.15	_	0.3		\Box [(29)
Walls Type17	9.63	2.46	7.17	x	0.15	_	1.08		\Box [(29)
Walls Type18	9.3	0	9.3	x	0.15	=	1.4		\Box [(29)
Walls Type19	0.6	0	0.6	x	0.15	=	0.09		\Box [(29)
Walls Type20	10.04	5.83	4.21	x	0.15] =	0.63				(29)
Walls Type21	5.77	0	5.77	x	0.15	=	0.87				(29)
Walls Type22	1.91	0	1.91	x	0.15	=	0.29		\Box [(29)
Walls Type23	17.21	0	17.21	x	0.15	=	2.58		\Box [(29)
Walls Type24	2.65	0	2.65	x	0.15	=	0.4		\Box [(29)
Walls Type25	16.14	0	16.14	x	0.15	=	2.42		\Box [(29)
Walls Type26	3.94	0	3.94	x	0.15	=	0.59		\Box [(29)
Walls Type27	9.7	7.38	2.32	x	0.15	=	0.35		\Box [(29)
Walls Type28	5.81	3.36	2.45	x	0.15	=	0.37		\Box [(29)
Roof Type1	33.58	4.48	29.1	x	0.13	=	3.78		\Box [(30)
Roof Type2	4.01	1.37	2.64	x	0.13	=	0.34				(30)
Total area of ele	ements, m²		290.94]							(31)
Party wall			27.41	x	0	=	0		\Box [(32)
Party wall			27.94	x	0	=	0		\Box [(32)
Party wall			40	x	0	=	0		\Box [(32)
		effective window U-v internal walls and par		using	formula 1/[(1/	U-valu	ue)+0.04] as g	iven in paragrapl	1 3.2		
Fabric heat loss	W/K = S(A)	(U)			(26)(30) + (32) =			98	3.66	(33)
Heat capacity C	m = S(A x k)					((28).	(30) + (32) +	(32a)(32e) =		0	(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium (35)250

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

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

if details of thermal bridging are not known (36) = $0.15 \times (31)$

Total fabric heat loss (33) + (36) =(37) 117.34

(38)m = $0.33 \times (25)$ m x (5)

Ventilation heat loss calculated monthly

Jan Feb Mar May Jun Jul Sep Oct Nov Dec Apr Aug

(36)

18.67

(00)	1	l ·											(00)
(38)m= 74.55	74.18	73.81	72.08	71.76	70.25	70.25	69.98	70.83	71.76	72.41	73.09		(38)
Heat transfer			100.10	100.00	407.50	407.50	407.04	· · ·	= (37) + (3		400.40		
(39)m= 191.89	191.51	191.14	189.42	189.09	187.59	187.59	187.31	188.17	189.09	189.75	190.43	190.41	(39)
Heat loss para	ameter (I	HLP), W	m²K				•		= (39)m ÷	Sum(39) ₁ .	12 / 1 Z=	189.41	(39)
(40)m= 1.69	1.68	1.68	1.67	1.66	1.65	1.65	1.65	1.65	1.66	1.67	1.67		_
Number of day	ys in mo	nth (Tab	le 1a)					/	Average =	Sum(40) ₁	12 /12=	1.67	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	-	-	-	-	-	-	-			-			
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occi	ınancv	N									04		(42)
if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		84		(42)
Annual averag	•	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		10	1.54		(43)
Reduce the annu- not more that 125	_				•	•	to achieve	a water us	se target o	f			
		· ·			_					·			
Jan Hot water usage i	Feb	Mar r day for ea	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	· ·						. /	00.54	100.57	407.00	444.00		
(44)m= 111.69	107.63	103.57	99.51	95.45	91.39	91.39	95.45	99.51	103.57	107.63	111.69	1210 40	(44)
Energy content of	f 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	1218.49	(44)
(45)m= 165.64	144.87	149.49	130.33	125.06	107.91	100	114.75	116.12	135.33	147.72	160.41		
If instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Γotal = Su	m(45) ₁₁₂ =		1597.63	(45)
(46)m= 24.85	21.73	22.42	19.55	18.76	16.19	15	17.21	17.42	20.3	22.16	24.06		(46)
Water storage	loss:						<u> </u>			<u> </u>	<u> </u>		
Storage volum	ne (litres)) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		210		(47)
If community h	•			•			` '						
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufac		eclared I	oss facto	or is kno	wn (kWh	n/dav):				1	57		(48)
Temperature f					(.,, , .					.6		(49)
Energy lost fro				ear			(48) x (49)	· =			94		(50)
b) If manufac		-	-		or is not	known:	, , , ,				<u> </u>		()
Hot water stor	-			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community he Volume factor	•		on 4.3										(==)
Temperature f			2h							-	0		(52) (53)
Energy lost from				oor			(47) v (51)	v (E2) v (I	= 2) _				
Enter (50) or		_	, KVVII/ye	zai			(47) x (51)	X (32) X ()) =	-	94		(54) (55)
Water storage			or each	month			((56)m = (55) × (41)r	m	<u>.</u>			(00)
(56)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(56)
If cylinder contain												хН	()
(57)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(57)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 0 0 0 0 0 0 0 0 0	0 0 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	- (46)m + (57)m + (59)m + (61)m
(62)m= 194.84 171.25 178.7 158.59 154.26 136.17 129.2 143.95 144.38 164.53	175.98 189.62 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	ution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	-
(63)m= 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 194.84 171.25 178.7 158.59 154.26 136.17 129.2 143.95 144.38 164.53	175.98 189.62
Output from water heat	er (annual) ₁₁₂ 1941.46 (64)
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)\text{m} + (61)\text{m}] + 0.8 \times [(46)\text{m}]$	n + (57)m + (59)m 1
(65)m= 78.44 69.27 73.07 65.94 64.94 58.49 56.61 61.52 61.22 68.36	71.72 76.7 (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):	nom community reading
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct (66)m= 141.77 141.77 141.77 141.77 141.77 141.77 141.77 141.77 141.77 141.77	
	141.77
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.70 05.00 (67)
(67)m= 24.68 21.92 17.82 13.49 10.09 8.52 9.2 11.96 16.05 20.38	23.79 25.36 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	(00)
(68)m= 276.8 279.67 272.43 257.02 237.57 219.29 207.08 204.2 211.44 226.85	246.3 264.58 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18 37.18	37.18 37.18 (69)
Pumps and fans gains (Table 5a)	,
(70)m= 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -113.42 -113.42 -113.42 -113.42 -113.42 -113.42 -113.42 -113.42 -113.42 -113.42 -113.42 -113.42	2 -113.42 -113.42 (71)
Water heating gains (Table 5)	
(72)m= 105.43 103.08 98.21 91.59 87.29 81.24 76.09 82.68 85.02 91.88	99.62 103.09 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m$	(71)m + (72)m
(73)m= 472.43 470.2 454 427.63 400.48 374.57 357.9 364.38 378.05 404.64	435.24 458.57 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations are calculated using the following the following the flux flux flux flux flux flux flux flux	able orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m ² Table 6a Table 6b	Table 6c (W)
Northeast 0.9x 0.77 x 7.38 x 11.28 x 0.76 x	0.7 = 30.7 (75)
Northeast 0.9x 0.77 x 6.71 x 11.28 x 0.76 x	0.7 = 27.91 (75)

N. a		1		1		1		1		1		_
Northeast _{0.9x}	0.77	X	7.38	X	22.97	X	0.76	X	0.7	=	62.49	(75)
Northeast _{0.9x}	0.77	X	6.71	X	22.97	X	0.76	X	0.7	=	56.82	(75)
Northeast _{0.9x}	0.77	X	7.38	X	41.38	X	0.76	X	0.7] =	112.58	(75)
Northeast _{0.9x}	0.77	X	6.71	X	41.38	X	0.76	X	0.7	=	102.36	(75)
Northeast _{0.9x}	0.77	X	7.38	X	67.96	X	0.76	X	0.7	=	184.9	(75)
Northeast _{0.9x}	0.77	X	6.71	X	67.96	X	0.76	X	0.7	=	168.11	(75)
Northeast 0.9x	0.77	X	7.38	X	91.35	X	0.76	X	0.7	=	248.54	(75)
Northeast _{0.9x}	0.77	X	6.71	X	91.35	X	0.76	X	0.7	=	225.97	(75)
Northeast _{0.9x}	0.77	X	7.38	X	97.38	X	0.76	X	0.7	=	264.97	(75)
Northeast 0.9x	0.77	X	6.71	X	97.38	X	0.76	x	0.7	=	240.91	(75)
Northeast _{0.9x}	0.77	X	7.38	X	91.1	X	0.76	X	0.7	=	247.87	(75)
Northeast _{0.9x}	0.77	X	6.71	X	91.1	X	0.76	X	0.7	=	225.37	(75)
Northeast _{0.9x}	0.77	X	7.38	x	72.63	X	0.76	x	0.7	=	197.61	(75)
Northeast 0.9x	0.77	X	6.71	x	72.63	x	0.76	x	0.7	=	179.67	(75)
Northeast _{0.9x}	0.77	X	7.38	x	50.42	X	0.76	x	0.7	=	137.19	(75)
Northeast _{0.9x}	0.77	X	6.71	x	50.42	X	0.76	x	0.7	=	124.73	(75)
Northeast _{0.9x}	0.77	X	7.38	x	28.07	x	0.76	x	0.7] =	76.37	(75)
Northeast _{0.9x}	0.77	X	6.71	x	28.07	x	0.76	x	0.7] =	69.43	(75)
Northeast _{0.9x}	0.77	x	7.38	x	14.2	x	0.76	x	0.7] =	38.63	(75)
Northeast _{0.9x}	0.77	x	6.71	×	14.2	x	0.76	x	0.7] =	35.12	(75)
Northeast _{0.9x}	0.77	x	7.38	x	9.21	x	0.76	x	0.7	j =	25.07	(75)
Northeast _{0.9x}	0.77	x	6.71	x	9.21	x	0.76	x	0.7] =	22.79	(75)
Southwest _{0.9x}	0.77	х	4.86	x	36.79	j	0.76	x	0.7	j =	65.93	(79)
Southwest _{0.9x}	0.77	x	5.19	x	36.79	j	0.76	x	0.7	j =	70.4	(79)
Southwest _{0.9x}	0.77	x	4.86	x	36.79	j	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	х	5.83	x	36.79	j	0.76	x	0.7	j =	79.08	(79)
Southwest _{0.9x}	0.77	x	4.86	x	62.67	j	0.76	x	0.7	j =	112.3	(79)
Southwest _{0.9x}	0.77	х	5.19	x	62.67	j	0.76	x	0.7	j =	119.92	(79)
Southwest _{0.9x}	0.77	х	4.86	x	62.67	j	0.76	x	0.7	j =	112.3	(79)
Southwest _{0.9x}	0.77	x	5.83	x	62.67	j	0.76	x	0.7	j =	134.71	(79)
Southwest _{0.9x}	0.77	x	4.86	x	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	x	5.19	x	85.75	j	0.76	x	0.7	j =	164.08	(79)
Southwest _{0.9x}	0.77	x	4.86	x	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	5.83	x	85.75	j	0.76	x	0.7	j =	184.32	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	İ	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	X	5.19	x	106.25	į	0.76	x	0.7	=	203.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	5.83	X	106.25	ĺ	0.76	x	0.7	=	228.38	(79)
Southwest _{0.9x}	0.77) x	4.86	X	119.01	ĺ	0.76	x	0.7	, =	213.24	(79)
Southwest _{0.9x}	0.77	X	5.19	X	119.01		0.76	x	0.7] =	227.72	(79)
Southwest _{0.9x}	0.77	X	4.86	X	119.01		0.76	x	0.7	=	213.24	(79)
L	<u> </u>	1		1		ı		ı	-		<u> </u>	_

Southwest _{0.9x}	0.77	1 ,	5.00	1 .	440.04	1	0.70	l v	0.7	1 _	255.0	(79)
Southwest _{0.9x}	0.77] X] ,,	5.83	X	119.01]]	0.76	X	0.7] =	255.8	=
Southwest _{0.9x}	0.77] X] ,,	4.86	X I	118.15]]	0.76	X	0.7] =] _	211.7	(79)
Southwest _{0.9x}	0.77]	5.19	l x l v	118.15]]	0.76	X	0.7] =] _	226.07	(79) (79)
Southwest _{0.9x}	0.77] X] ,	4.86	l x	118.15]]	0.76	X	0.7] =] _	211.7	$ = \begin{pmatrix} 79 \\ (79) \end{pmatrix} $
Southwest _{0.9x}	0.77] X] _v	5.83	l x l v	118.15]]	0.76	X] = 1 _	253.95	$= \frac{(79)}{(79)}$
Southwest _{0.9x}	0.77	」 x] x	4.86	x x	113.91]]	0.76	x	0.7] =] =	204.1	(79)
Southwest _{0.9x}	0.77	」^] _×	5.19 4.86] ^] _x	113.91]]	0.76	^ x	0.7] -] =	217.96	(79)
Southwest _{0.9x}	0.77	」^] ×	5.83] ^] x	113.91]]	0.76	X	0.7] -] =	244.83	(79)
Southwest _{0.9x}	0.77	」^] ×	4.86] ^] x	104.39	<u> </u> 	0.76	X	0.7] =] =	187.04	(79)
Southwest _{0.9x}	0.77	」^] ×	5.19] ^] _x	104.39]]	0.76	X	0.7] =	199.74	(79)
Southwest _{0.9x}	0.77	」^] _×	4.86) ^ x	104.39]]	0.76	X	0.7] -] =	187.04	(79)
Southwest _{0.9x}	0.77	」^] ×	5.83] ^] x	104.39]]	0.76	X	0.7]	224.37	(79)
Southwest _{0.9x}	0.77	」^] _×	4.86] ^] x	92.85]]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77] ^] x	5.19) ^ x	92.85]]	0.76	X	0.7] -] =	177.67	(79)
Southwest _{0.9x}	0.77] ^] _x	4.86] ^] x	92.85]]	0.76	X	0.7]	166.37	(79)
Southwest _{0.9x}	0.77] ^] x	5.83) ^ x	92.85]]	0.76	X	0.7] -] =	199.57	(79)
Southwest _{0.9x}	0.77] ^] x	4.86] ^ x	69.27]]	0.76	X	0.7]	124.11	(79)
Southwest _{0.9x}	0.77] ^] _X	5.19] ^] x	69.27]]	0.76	X	0.7]	132.54	(79)
Southwest _{0.9x}	0.77] ^] _x	4.86] ^ x	69.27]]	0.76	X	0.7]	124.11	(79)
Southwest _{0.9x}	0.77]	5.83] ^] x	69.27	<u> </u> 	0.76	x	0.7]] =	148.88	(79)
Southwest _{0.9x}	0.77]	4.86] ^] _x	44.07]]	0.76	X	0.7]] =	78.96	(79)
Southwest _{0.9x}	0.77]	5.19] ^] x	44.07]]	0.76	x	0.7]] =	84.33	(79)
Southwest _{0.9x}	0.77] x	4.86) x	44.07]]	0.76	x	0.7]] =	78.96	(79)
Southwest _{0.9x}	0.77]]	5.83]]	44.07]]	0.76	X	0.7]] =	94.72	(79)
Southwest _{0.9x}	0.77	」] _X	4.86	l l x	31.49]]	0.76	X	0.7]] =	56.42	(79)
Southwest _{0.9x}	0.77]]	5.19) x	31.49	<u> </u> 	0.76	X	0.7] =	60.25	(79)
Southwest _{0.9x}	0.77	X	4.86) x	31.49	<u> </u> 	0.76	X	0.7] =	56.42	(79)
Southwest _{0.9x}	0.77	X	5.83	X	31.49	ĺ	0.76	x	0.7	j =	67.68	(79)
Northwest 0.9x	0.77	X	1.4	X	11.28	X	0.76	X	0.7	j =	5.82	(81)
Northwest _{0.9x}	0.77	X	3.36	x	11.28	x	0.76	x	0.7	=	13.98	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest 0.9x	0.77	X	3.36	x	22.97	x	0.76	х	0.7	j =	28.45	(81)
Northwest _{0.9x}	0.77	j×	1.4	x	41.38	x	0.76	х	0.7	j =	21.36	(81)
Northwest _{0.9x}	0.77	X	3.36	x	41.38	x	0.76	х	0.7	j =	51.26	(81)
Northwest _{0.9x}	0.77	×	1.4	×	67.96	x	0.76	x	0.7	j =	35.08	(81)
Northwest _{0.9x}	0.77	X	3.36	x	67.96	x	0.76	x	0.7	j =	84.18	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	j =	47.15	(81)
Northwest _{0.9x}	0.77	j×	3.36	x	91.35	x	0.76	x	0.7	j =	113.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7] =	50.26	(81)
Northwest _{0.9x}	0.77	X	3.36	x	97.38	×	0.76	x	0.7] =	120.64	(81)
		-		•		•			•	•		_

Northwest _{0.9x}	0.77	x	1.4	x	91.1] x	0.76	x	0.7	1 =	47.02	(81)
Northwest 0.9x	0.77] ^] x	3.36	l ^	91.1] ^] _x	0.76	x	0.7]	112.85	(81)
Northwest 0.9x	0.77] ^] x	1.4	l ^	72.63] ^] _x	0.76	x	0.7]	37.49	(81)
Northwest 0.9x	0.77] x	3.36	x	72.63] x	0.76	x	0.7]] =	89.97	(81)
Northwest 0.9x	0.77]]	1.4	l X	50.42]] _x	0.76	X	0.7]] =	26.02	(81)
Northwest 0.9x	0.77] x	3.36	X	50.42] x	0.76	x	0.7]] =	62.46	(81)
Northwest 0.9x	0.77]]	1.4	l X	28.07]] _x	0.76	X	0.7]] =	14.49	(81)
Northwest _{0.9x}	0.77) x	3.36	X	28.07) x	0.76	X	0.7] =	34.77	(81)
Northwest _{0.9x}	0.77	X	1.4	X	14.2	X	0.76	x	0.7	j =	7.33	(81)
Northwest 0.9x	0.77	X	3.36	х	14.2	X	0.76	X	0.7	=	17.59	(81)
Northwest _{0.9x}	0.77	x	1.4	x	9.21	x	0.76	x	0.7	j =	4.76	(81)
Northwest _{0.9x}	0.77	x	3.36	x	9.21	x	0.76	х	0.7	j =	11.41	(81)
Rooflights _{0.9x}	1	x	3.35	x	26	x	0.76	х	0.7	j =	41.7	(82)
Rooflights _{0.9x}	1	x	1.13	х	26	x	0.76	x	0.7	j =	14.07	(82)
Rooflights _{0.9x}	1	x	1.37	x	26	x	0.76	x	0.7	=	17.05	(82)
Rooflights _{0.9x}	1	x	3.35	x	54	x	0.76	x	0.7	=	86.61	(82)
Rooflights _{0.9x}	1	x	1.13	x	54	x	0.76	x	0.7] =	29.22	(82)
Rooflights _{0.9x}	1	X	1.37	x	54	x	0.76	x	0.7	=	35.42	(82)
Rooflights _{0.9x}	1	x	3.35	х	96	x	0.76	x	0.7	=	153.98	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	=	51.94	(82)
Rooflights _{0.9x}	1	X	1.37	X	96	X	0.76	x	0.7	=	62.97	(82)
Rooflights _{0.9x}	1	X	3.35	X	150	x	0.76	x	0.7	=	240.6	(82)
Rooflights _{0.9x}	1	X	1.13	X	150	X	0.76	X	0.7	=	81.16	(82)
Rooflights _{0.9x}	1	X	1.37	x	150	x	0.76	x	0.7	=	98.39	(82)
Rooflights _{0.9x}	1	X	3.35	X	192	x	0.76	x	0.7	=	307.96	(82)
Rooflights _{0.9x}	1	X	1.13	X	192	X	0.76	X	0.7	=	103.88	(82)
Rooflights _{0.9x}	1	X	1.37	x	192	x	0.76	X	0.7	=	125.94	(82)
Rooflights _{0.9x}	1	X	3.35	x	200	X	0.76	X	0.7	=	320.8	(82)
Rooflights 0.9x	1	X	1.13	x	200	X	0.76	x	0.7	=	108.21	(82)
Rooflights 0.9x	1	X	1.37	X	200	X	0.76	X	0.7	=	131.19	(82)
Rooflights 0.9x	1	X	3.35	X	189	X	0.76	X	0.7	=	303.15	(82)
Rooflights 0.9x	1	X	1.13	x	189	X	0.76	X	0.7	=	102.26	(82)
Rooflights 0.9x	1	X	1.37	X	189	X	0.76	X	0.7	=	123.98	(82)
Rooflights 0.9x	1	X	3.35	X	157	X	0.76	X	0.7	=	251.82	(82)
Rooflights 0.9x	1	X	1.13	X	157	X	0.76	X	0.7	=	84.94	(82)
Rooflights 0.9x	1	X	1.37	X	157	X	0.76	X	0.7	=	102.99	(82)
Rooflights 0.9x	1	X	3.35	X	115	X	0.76	X	0.7] =	184.46	(82)
Rooflights 0.9x	1	X	1.13	X	115	X	0.76	X	0.7] = 1	62.22	(82)
Rooflights 0.9x	1	X	1.37	X	115	X	0.76	X	0.7	=	75.43	(82)
Rooflights 0.9x	1	X	3.35	X	66	X	0.76	X	0.7	=	105.86	(82)
Rooflights _{0.9x}	1	X	1.13	X	66	X	0.76	X	0.7	=	35.71	(82)

Rooflights 0.9x	1	X	1.3	57	x	66] x [0.76	x	0.7	=	43.29	(82)
Rooflights 0.9x	1	X	3.3	5	x	33] x [0.76	x	0.7	=	52.93	(82)
Rooflights 0.9x	1	X	1.1	3	x	33	x [0.76	x	0.7	=	17.85	(82)
Rooflights 0.9x	1	Х	1.3	37	x	33] x [0.76	x	0.7	=	21.65	(82)
Rooflights 0.9x	1	х	3.3	55	x	21	×	0.76	x	0.7	=	33.68	(82)
Rooflights 0.9x	1	x	1.1	3	x	21	×	0.76	x	0.7		11.36	(82)
Rooflights 0.9x	1	X	1.3	57	x	21	×	0.76	x	0.7		13.78	(82)
•							_						
Solar gains in	watts, ca	alculated	for eac	n month			(83)m	= Sum(74)	m(82)m			_	
(83)m= 432.57	790.08	1212.15	1704.84	2082.6	2140.39	2033.49	1742.	68 1382.	49 909.56	5 528.07	363.62		(83)
Total gains –	internal a	nd solar	(84)m =	(73)m ·	+ (83)m	, watts						•	
(84)m= 905	1260.28	1666.15	2132.48	2483.07	2514.96	2391.38	2107.	06 1760.	54 1314.2	1 963.31	822.19		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)			21	(85)
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Se	p Oct	Nov	Dec		
(86)m= 0.99	0.98	0.94	0.82	0.64	0.46	0.34	0.4	0.66	0.92	0.99	1		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Ta	able 9c)		•		•	
(87)m= 21	21	21	21	21	21	21	21	21	21	21	21		(87)
Temperature	during h	eating n	oriode ir	roct of	dwellin	a from Ta	hla 0	 Th2 (°(<u> </u>		1	l	
(88)m= 19.55	19.55	19.55	19.57	19.57	19.58	19.58	19.5		<u> </u>	19.56	19.56		(88)
` '	ļ				<u> </u>	ļ		-	1		1		, ,
Utilisation fac	ctor for garage		est of d	welling, 0.56	· `	1	T	3 0.55	- 0.00	0.98	0.99		(89)
` '	ļ	0.91			0.37	0.23	0.28	<u>İ</u>		0.96	0.99		(03)
Mean interna	T .				- ` `	1	i 				1	1	(22)
(90)m= 19.55	19.55	19.55	19.57	19.57	19.58	19.58	19.5	8 19.5			19.56		(90)
									tLA = Liv	ing area ÷ ((4) =	0.33	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = 1	fLA × T1	+ (1 -	-fLA) ×	T2				
(92)m= 20.03	20.03	20.03	20.04	20.04	20.05	20.05	20.0			20.04	20.03		(92)
Apply adjust	_					1	1				1	1	
(93)m= 20.03	20.03	20.03	20.04	20.04	20.05	20.05	20.0	5 20.0	4 20.04	20.04	20.03		(93)
8. Space hea										(= a)			
Set Ti to the the utilisation					ied at si	tep 11 of	lable	9b, so	that II,m=	=(76)m ar	id re-cald	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Se	p Oct	Nov	Dec		
Utilisation fa			•			1		9 33	- 1	1	1	l	
(94)m= 0.99	0.97	0.92	0.79	0.59	0.4	0.27	0.32	0.59	0.89	0.98	0.99		(94)
Useful gains	, hmGm ,	W = (94	4)m x (84	4)m		•							
(95)m= 898.01	1228.26	1536.38	1677.3	1460.55	1001.84	643.34	676.9	97 1036.	38 1172.7	2 945.98	817.69		(95)
Monthly avei	rage 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			7.1	4.2		(96)
Heat loss rat	_					, - `					1	1	
(97)m= 3018.09		2586.5		1577.12		<u> </u>	683.3		55 1785.1		3015.41		(97)
Space heatir	Ť					1		-i	` 		1005 :	1	
(98)m= 1577.34	1121.79	781.28	311.49	86.73	0	0	0	0	455.63	1086.41	1635.1		

				Tota	l por voor	(k)Mh/yoo	r) – Sum/0	ا ۱۵۱	7055.77	(98)
	1.34/1 / 0/			TOLA	ii pei yeai	(KVVII/yea	r) = Sum(9	O)15,912 =		
Space heating requirement i								l	62.05	(99)
9a. Energy requirements – In	dividual heatir	ng systems i	including	micro-C	CHP)					
Space heating: Fraction of space heat from	secondary/su	polementary	/ svstem					[0	(201)
Fraction of space heat from	•		•	(202) = 1	- (201) =				1	(202)
Fraction of total heating from	,	•		(204) = (2	02) × [1 –	(203)] =		 	1	(204)
Efficiency of main space hea	•								229.4	(206)
Efficiency of secondary/supp	olementary he	ating systen	n, %						0	(208)
Jan Feb Mar	Apr M	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ear
Space heating requirement	calculated ab	ove)								
1577.34 1121.79 781.28	311.49 86	.73 0	0	0	0	455.63	1086.41	1635.1		
(211) m = {[(98)m x (204)] } x				1	ı	ı	1			(211)
687.6 489.01 340.58	135.78 37	.81 0	0	O Tota	0 L (k\\/\b/\/\o	198.62	473.59 211) _{15,1012}	712.78	0075.70	7(044)
Chara haating final (accorde		.415		TOTA	ii (KVVII/yed	ar) =Surri	Z I I) _{15,1012}	<i>-</i>	3075.76	(211)
Space heating fuel (seconda = $\{[(98)m \times (201)]\} \times 100 \div (201)$	• •	itri								
(215)m = 0 0 0	 	0	0	0	0	0	0	0		
	•	•	•	Tota	l (kWh/yea	ar) =Sum(215),15,1012	2=	0	(215)
Water heating								•		_
Output from water heater (cal		e) 1.26 136.17	129.2	143.95	144.38	164.53	175.98	189.62		
Efficiency of water heater	130.39	130.17	129.2	143.33	144.30	104.55	175.90	109.02	100	(216)
(217)m= 100 100 100	100 10	00 100	100	100	100	100	100	100	100	(217)
Fuel for water heating, kWh/n	nonth	I	!	ļ.	<u> </u>	<u>l</u>	!	ļJ		
$(219)m = (64)m \times 100 \div (217)$		100 100 47	100.0	140.05	444.00	104.50	175.00	100.00		
(219)m= 194.84 171.25 178.7	158.59 154	1.26 136.17	129.2		144.38 I = Sum(2		175.98	189.62	1941.46	(219)
Annual totals					. • • • • • • • • • • • • • • • • • • •		Wh/year	. l	kWh/yea	— ` `
Space heating fuel used, mai	n system 1						, y ou.		3075.76	T
Water heating fuel used									1941.46	Ħ
Electricity for pumps, fans and	d electric keep	o-hot						L		
Total electricity for the above	·			sum	of (230a).	(230g) =	:	[0	(231)
Electricity for lighting	•							[[435.8	(232)
Electricity generated by PVs								l [-778.07	(233)
12a. CO2 emissions – Indivi	dual heating s	systems incl	udina mi	cro-CHF				L	170.07	
	adai nediing s									
			nergy Vh/year			Emiss kg CO	i on fac 2/kWh	tor	Emission: kg CO2/ye	
Space heating (main system	1)		1) x					= [(261)
	'/					0.5		l	1596.32	=
Space heating (secondary)		(21	5) x			0.5	19	= [0	(263)

Water heating	(219) x	0.519	=	1007.62	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2603.94	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	226.18	(268)
Energy saving/generation technologies Item 1		0.519	=	-403.82	(269)
Total CO2, kg/year	sum	n of (265)(271) =		2426.3	(272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =		21.34	(273)
El rating (section 14)				80	(274)

		User Details:					
Assessor Name:	Su Lee	Stroma Num	nber:	STRO0	31315		
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Version	sion: 1.0.4.16		
	Pro	perty Address: Unit 02	2				
Address :	138-140 Highgate Road, High	gate, Highgate, NW5	1PB				
1. Overall dwelling dime	ensions:), i		
Basement		Area(m²) 39.95 (1a) x	Av. Height(m)	(2a) =	107.87	(3a)	
Ground floor		35.19 (1b) x		(2b) =	112.61] (3b)	
First floor		32.26 (1c) x	4.65	(2c) =	150.01] (3c)	
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	107.4 (4)				_	
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	(3n) =	370.48	(5)	
2. Ventilation rate:				_			
	main secondary heating heating	other	total		m³ per hour	,	
Number of chimneys	0 + 0	+ 0 =	0 x 4	0 =	0	(6a)	
Number of open flues	0 + 0	+ 0 =	0 x 2	0 =	0	(6b)	
Number of intermittent fa	ns		5 x 1	0 =	50	(7a)	
Number of passive vents			0 x 1	0 =	0	(7b)	
Number of flueless gas fi	res		0 x 4	0 =	0	(7c)	
				Air cha	nges per ho	ur	
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	50 ÷	· (5) =	0.13	(8)	
	een carried out or is intended, proceed	to (17), otherwise continue f	rom (9) to (16)	_		<u>-</u>	
Number of storeys in the	ne dwelling (ns)				0	(9)	
Additional infiltration				1]x0.1 =	0	(10)	
	.25 for steel or timber frame or 0	•	ruction		0	(11)	
if both types of wall are pi deducting areas of openir	resent, use the value corresponding to t ngs); if equal user 0.35	ne greater wall area (after					
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0			0	(12)	
If no draught lobby, en	ter 0.05, else enter 0				0	(13)	
Percentage of windows	s and doors draught stripped				0	(14)	
Window infiltration		0.25 - [0.2 x (14) ÷	100] =		0	(15)	
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =		0	(16)	
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope	area	4	(17)	
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$	otherwise (18) = (16)			0.33	(18)	
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used			_	
Number of sides sheltere	ed				2	(19)	
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =		0.85	(20)	
Infiltration rate incorporat	ting shelter factor	$(21) = (18) \times (20) =$			0.28	(21)	
Infiltration rate modified f	or monthly wind speed	, ,	, ,				
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec			
Monthly average wind sp	eed from Table 7						

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
				_					<u>!</u>	<u> </u>			
Adjusted infiltra			<u> </u>			` 	`	ì ´	I				
0.36 Calculate effec	0.36 ctive air	0.35 change	0.31 rate for t	0.31 he appli	0.27 Cable ca	0.27 S e	0.26	0.28	0.31	0.32	0.33		
If mechanica		-			J G G G G G G G G G G G G G G G G G G G							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(23b)
If balanced with	heat reco	very: effic	iency in %	allowing for	or in-use f	actor (from	n Table 4h) =			İ	0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	– (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		ı	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				-	•								
if (22b)m		<u> </u>	<u> </u>	<u> </u>		· ` `	ŕ		· ` ·			ı	(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(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		(24d)
Effective air	change	rate - er	ter (24a	or (24h	o) or (24)	c) or (24	d) in box	L x (25)	!	ļ			
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
							•		•	•		l	
3 Heat Insses	s and he	at Ince i	naramete	ar.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value	<u>.</u>	AXk
3. Heat losses		ss	oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	Gros	ss	Openin	gs		n²				K)			
ELEMENT	Gros area	ss	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	K)			kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	ss	Openin	gs	A ,r 2.46 4.86	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	ss	Openin	gs	A ,r 2.46 4.86 5.21	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	K)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86 6.44	K)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	K)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 e 1	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	es (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 9	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95 10.29 0.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935 1.54 0.04				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3 10.2 5.1 1.38	9 5	0 4.86	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95 10.29 0.24 -0.05	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935 1.54 0.04 -0.01				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 39.95 10.29 0.24	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.1935 1.54 0.04				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8	x 0.15 =	0.12			(29)
Walls Type7 0.96 0	0.96	x 0.15 =	0.14			(29)
Walls Type8 5.63 0	5.63	x 0.15 =	0.84			(29)
Walls Type9 4.96 0	4.96	x 0.15 =	0.74			(29)
Walls Type10 5.76 4.86	0.9	x 0.15 =	0.14			(29)
Walls Type11 0.42 0	0.42	x 0.15 =	0.06			(29)
Walls Type12 6.4 0	6.4	x 0.15 =	0.96			(29)
Walls Type13 9.11 5.29	3.82	x 0.15 =	0.57			(29)
Walls Type14 1.86 0	1.86	x 0.15 =	0.28			(29)
Walls Type15 8.6 2.46	6.14	x 0.15 =	0.92			(29)
Walls Type16 9.3 0	9.3	x 0.15 =	1.4			(29)
Walls Type17 0.6 0	0.6	x 0.15 =	0.09			(29)
Walls Type18 8.37 4.86	3.51	x 0.15 =	0.53			(29)
Roof Type1 31.76 4.5	27.26	x 0.13 =	3.54		i	(30)
Roof Type2 3.02 0.98	2.04	x 0.13 =	0.27		i	(30)
Total area of elements, m ²	165.72					(31)
Party wall	28.78	x 0 =	0		7	(32)
Party wall	27.84	x 0 =	0		ī	(32)
Party wall	32.1	x 0 =	0		ī	(32)
Party wall	32.96	x 0 =	0		ī	(32)
Party wall	38.6	x 0 =	0		ī	(32)
Party wall	40	x 0 =	0		ī	(32)
* for windows and roof windows, use effective window		ing formula 1/[(1/U-val	ue)+0.04] as given ir	n paragraph :	3.2	
** include the areas on both sides of internal walls and Fabric heat loss, W/K = S (A x U)	paruuons	(26)(30) + (32) =		Г	70.34	(33)
Heat capacity $Cm = S(A \times k)$			(30) + (32) + (32a)	(32e) = [0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA	A) in kJ/m²K	** /	ative Value: Medium	Γ	250	(35)
For design assessments where the details of the cons	,	precisely the indicativ	e values of TMP in T	_able 1f	200	
can be used instead of a detailed calculation.				_		_
Thermal bridges: S (L x Y) calculated using				L	15.84	(36)
if details of thermal bridging are not known (36) = 0.15 Total fabric heat loss	x (31)	(33)	+ (36) =		86.18	(37)
Ventilation heat loss calculated monthly		(38)n	$n = 0.33 \times (25) \text{m} \times (5)$	j)		
Jan Feb Mar Apr M	ay Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 69.19 68.87 68.57 67.13 66.	86 65.6 65.6	65.37 66.08	66.86 67.4	67.97		(38)
Heat transfer coefficient, W/K		(39)n	n = (37) + (38)m			
(39)m= 155.37 155.06 154.75 153.31 153	.04 151.79 151.7	9 151.55 152.27	153.04 153.58	154.15		_
Heat loss parameter (HLP), W/m²K		(40)n	Average = Sum(39) $n = (39)m \div (4)$	112 /12=	153.31	(39)
(40)m= 1.45 1.44 1.44 1.43 1.4	1.41 1.41		1.42 1.43	1.44		
			Average = Sum(40)	' 	1.43	(40)
Number of days in month (Table 1a)		 	T a . T	 _ 		
Jan Feb Mar Apr M	ay 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 requ	irement:								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 (1	ΓFA -13.		.8		(42)
Annual avera Reduce the annu not more that 12	ge hot wa gelaverage	hot water	usage by	5% if the a	lwelling is	designed i			se target of		0.66		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 110.73	106.7	102.67	98.65	94.62	90.59	90.59	94.62	98.65	102.67	106.7	110.73		,
Energy content of	Total = Sum(44) ₁₁₂ = 120 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)												(44)
(45)m= 164.2	143.61	148.2	129.2	123.97	106.98	99.13	113.75	115.11	134.15	146.44	159.02		
If instantaneous	water heati	ing at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Sur	m(45) ₁₁₂ =		1583.76	(45)
(46)m= 24.63	21.54	22.23	19.38	18.6	16.05	14.87	17.06	17.27	20.12	21.97	23.85		(46)
Water storage		المارات المارات		-lo o \A	MAILIDO	-1	م ماطانات		1			' 	()
Storage volur	•		•			_		ame ves	sei		210		(47)
If community Otherwise if r	_			_			` '	ers) ente	er '0' in <i>(4</i>	47)			
Water storage			. (0.0, 0		,			
a) If manufac	turer's d	eclared I	oss fact	or is kno	wn (kWh	n/day):				1.	57		(48)
Temperature	factor fro	m Table	2b							0	.6		(49)
Energy lost fr b) If manufac		•			or is not		(48) x (49)) =		0.	94		(50)
Hot water sto			-								0		(51)
If community	•		on 4.3										
Volume facto			01								0		(52)
Temperature											0		(53)
Energy lost fr Enter (50) or		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Water storage	. , .	•	for each	month			((56)m - ((55) × (41)r	m	0.	94		(55)
(56)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(56)
If cylinder contain												ix H	(50)
(57)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(57)
Primary circu	t loss (ar	nual) fro	m Table	 e 3			•				0		(58)
Primary circu	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat red	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.4	169.99	177.4	157.46	153.17	135.24	128.33	142.96	143.37	163.35	174.7	188.22		(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)															
(add a	dditiona	I lines if	FGHRS	and/or	WWHRS	ар	plies, see Ap	pend	dix G)				-	
(63)m=	0	0	0	0	0		0 0	()	0	0	0	0		(63)
Output	from w	ater hea	ter	_	_		_		_			_		_	
(64)m=	193.4	169.99	177.4	157.46	153.17	13	35.24 128.33	142	.96	143.37	163.35	174.7	188.22		_
									Outp	out from wa	iter heate	er (annual)₁	12	1927.59	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′	[0.85 × (45)m	+ (6	31)m] + 0.8 x	[(46)m	+ (57)m	+ (59)m	<u>ı</u>]	
(65)m=	77.96	68.85	72.64	65.57	64.58	5	8.18 56.32	61.	18	60.88	67.97	71.3	76.24		(65)
inclu	de (57)	m in cald	culation	of (65)m	only if c	ylin	der is in the	dwel	ling	or hot wa	ater is f	rom com	munity l	neating	
5. Int	ernal ga	ains (see	Table	5 and 5a	n):										
Metabo	olic gain	s (Table	5), Wa	tts	_									-	
	Jan	Feb	Mar	Apr	May	,	Jun Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m=	139.91	139.91	139.91	139.91	139.91	13	9.91 139.91	139	.91	139.91	139.91	139.91	139.91		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion	L9 or L9a), a	lso s	ee 7	Table 5				_	
(67)m=	23.87	21.2	17.24	13.05	9.76	8	8.24 8.9	11.	57	15.53	19.72	23.02	24.54		(67)
Applia	nces ga	ins (calc	ulated i	n Appen	dix L, eq	uat	ion L13 or L1	3a),	also	see Tab	ole 5				
(68)m=	267.77	270.54	263.54	248.64	229.82	21	2.14 200.32	197	.54	204.54	219.45	238.27	255.95]	(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equa	tion	L15 or L15a)	, als	o se	e Table	5			_	
(69)m=	36.99	36.99	36.99	36.99	36.99	3	6.99 36.99	36.	99	36.99	36.99	36.99	36.99]	(69)
Pumps	and fa	ns gains	(Table	5a)	•		•			•		•		-	
(70)m=	0	0	0	0	0		0 0	()	0	0	0	0]	(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	ıes) (Tab	ole 5	 5)					-		_	
(71)m=	-111.93	-111.93	-111.93	-111.93	-111.93	-11	11.93 -111.93	-111	.93	-111.93	-111.93	-111.93	-111.93]	(71)
Water	heating	gains (T	able 5)				•			•				_	
(72)m=	104.78	102.46	97.63	91.07	86.8	8	0.8 75.7	82.	24	84.56	91.35	99.03	102.47]	(72)
Total i	nternal	gains =			•		(66)m + (67)m	+ (68	3)m +	- (69)m + (70)m + (71)m + (72))m	_	
(73)m=	461.4	459.18	443.39	417.73	391.36	36	66.15 349.9	356	.32	369.61	395.5	425.28	447.93]	(73)
6. Sol	ar gains	S:				<u> </u>	,					•			
Solar g	ains are	calculated	using sola	ar flux from	Table 6a	and	associated equa	tions	to co	nvert to the	e applica	ble orientat	tion.		
Orienta		Access F		Area	ì		Flux		_	g_ al	_	FF		Gains	
	_	Table 6d		m²		_	Table 6a	_		able 6b		able 6c		(W)	
Northea	ast _{0.9x}	0.77	X	5.	29	X	11.28	X		0.76	x	0.7	=	22.01	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	11.28	X		0.76	x	0.7	=	22.01	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	22.97	X		0.76	x [0.7	=	44.79	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	22.97	x		0.76	x [0.7	=	44.79	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	41.38	x		0.76	x	0.7	=	80.7	(75)
Northea	ast _{0.9x}	0.77	X	5.	29	x	41.38	x		0.76	x	0.7	=	80.7	(75)
Northea	ast _{0.9x}	0.77	×	5.	29	x	67.96	x		0.76	_ x [0.7	=	132.53	(75)
Northea	ast _{0.9x}	0.77	×	5.	29	x	67.96	x		0.76	_ x [0.7	=	132.53	(75)
Northea	ast _{0.9x}	0.77	×	5.	29	x	91.35	x		0.76	x	0.7	=	178.15	(75)
Northea	ast _{0.9x}	0.77	×	5.	29	x	91.35	х		0.76	_ × [0.7		178.15	(75)
	_					•		_			_				

Northeast _{0.9x}	0.77	7 x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]] _x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] X	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7] =	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7	<u> </u>	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Rooflights 0.9x		—			. —		1 .,	0.70	ا ا		_	45.05	(00)
Rooflights 0.9x	1	X	0.98	=	×	96] X	0.76	× [0.7	_ =	45.05	(82)
	1	×	3.37	=	-	150	」 X T	0.76	_ X	0.7	_ =	242.03	(82)
Rooflights 0.9x	1	X	1.13	=		150	」 X ∃	0.76	_ X	0.7	=	81.16	(82)
Rooflights 0.9x	1	x	0.98	╡ '	-	150	J X	0.76	× [0.7	=	70.38	(82)
Rooflights 0.9x	1	Х	3.37	╡ '	x	192	X	0.76	×	0.7	=	309.8	(82)
Rooflights 0.9x	1	X	1.13	'	x	192	X	0.76	×	0.7	=	103.88	(82)
Rooflights 0.9x	1	X	0.98		x	192	X	0.76	X	0.7	=	90.09	(82)
Rooflights _{0.9x}	1	X	3.37	;	x	200	X	0.76	X	0.7	=	322.71	(82)
Rooflights 0.9x	1	X	1.13		X :	200	X	0.76	X	0.7	=	108.21	(82)
Rooflights 0.9x	1	X	0.98		x :	200	X	0.76	X	0.7	=	93.84	(82)
Rooflights 0.9x	1	X	3.37		X	189	X	0.76	X	0.7	=	304.96	(82)
Rooflights 0.9x	1	X	1.13		x	189	X	0.76	x	0.7	=	102.26	(82)
Rooflights 0.9x	1	X	0.98	,	x	189	X	0.76	x	0.7	=	88.68	(82)
Rooflights 0.9x	1	x	3.37	<u> </u>	x	157	X	0.76	X	0.7	=	253.33	(82)
Rooflights 0.9x	1	x	1.13	-	x	157	X	0.76	x	0.7	=	84.94	(82)
Rooflights 0.9x	1	х	0.98	=	x	157	X	0.76	x	0.7	=	73.67	(82)
Rooflights _{0.9x}	1	x	3.37	= ,	x	115	j x	0.76	×	0.7	-	185.56	(82)
Rooflights _{0.9x}	1	x	1.13	= ,	x 🗀	115	X	0.76	×	0.7		62.22	(82)
Rooflights _{0.9x}	1	x	0.98	╡,	x	115]]	0.76	×	0.7		53.96	(82)
Rooflights _{0.9x}	1	×	3.37	= ,	x 🗀	66]]	0.76	_ x	0.7	╡ -	106.49	(82)
Rooflights 0.9x	1	×	1.13	۲,	x 🗀	66	」 】	0.76	x	0.7	╡ -	35.71	(82)
Rooflights 0.9x	<u>·</u> 1	×	0.98	=	x 🗀	66]]	0.76	_	0.7	╡ -	30.97	(82)
Rooflights 0.9x	1	×	3.37	=	x	33]	0.76		0.7	= =	53.25	(82)
Rooflights 0.9x	1		1.13	=	x	33] ^] _X	0.76	^ [x [0.7	_	17.85	(82)
Rooflights 0.9x	1		0.98	=	x -	33] ^] _X	0.76	^	0.7		15.48	(82)
Rooflights 0.9x	1	$=$ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$		=	^		」^] _x		^ x		-		(82)
Rooflights 0.9x		=	3.37	=		21	1	0.76	╡ ¦	0.7	=	33.88	(82)
Rooflights 0.9x	1	X	1.13	=	x	21] X]	0.76	× [0.7	_ =	11.36	= ' '
Tooliights 0.9x	1	X	0.98		x	21	X	0.76	x	0.7	=	9.85	(82)
Color going in	watta aal	ouloto d	for each m	onth			(02)~	Cum/74)m	(00)~				
Solar gains in (83)m= 386.5			1468.94 177		1816.92	1729.37		1 = Sum(74)m. 1.36 1201.89		470.83	325.54	1	(83)
Total gains – in							1	1.00 1201.00	002.02	170.00	020.01]	()
(84)m= 847.9			1886.67 216		` '		1850	0.68 1571.5	1198.0	2 896.11	773.46]	(84)
` ′							<u> </u>						
7. Mean inter		,				from Tol	hla O	Th4 (9C)					(85)
Temperature	_	٠.			_		DIE 9	, 1111 (C)				21	(00)
Utilisation fac	Feb	Mar			Jun	Jul	Ι	ug Sep	Oct	Nov	Dec	1	
(86)m= 0.99	0.98	0.93		<i>l</i> lay 61	0.44	0.32	0.3		0.9	0.99	1		(86)
` ′			l	I			<u> </u>		0.9	0.99	_ '		(00)
Mean interna						i	т —		i		1	1	
(87)m= 21	21	21	21 2	21	21	21	2	1 21	21	21	21]	(87)
Temperature	during he	ating pe	eriods in res	st of o	dwelling	from Ta	able 9	9, Th2 (°C)				,	
(88)m= 19.73	19.73	19.73	19.74 19	.74	19.75	19.75	19.	75 19.75	19.74	19.74	19.74		(88)

Utilisatio	on facto	or for a	nine for I	ract of d	volling k	2 m (cc	o Tablo	00)						
	0.99	0.97	0.91	0.75	0.54	0.36	0.23	9a) 0.27	0.53	0.87	0.98	0.99		(89)
` ′											0.90	0.99		(00)
Mean in (90)m= 1	19.73	19.73	19.73	tne rest	ot awelli	ng 12 (fo	19.75	19.75	7 IN T abi	e 9c) 19.74	19.74	19.74		(90)
(30)11-	15.75	15.75	13.73	13.74	13.74	10.70	15.75	10.70		LA = Livin			0.33	(91)
										•	5 (′ [0.00	
Mean in		` _										T 1		(00)
` '	20.14	20.15	20.15	20.15	20.16	20.16	20.16	20.16	20.16	20.16	20.15	20.15		(92)
Apply ac		20.15	ne mean 20.15	20.15	tempera 20.16	20.16	m Table 20.16	4e, wne	20.16	20.16	20.15	20.45		(93)
` '					20.16	20.16	20.16	20.16	20.16	20.16	20.15	20.15		(33)
8. Space					o obtoin	ad at at	on 11 of	Table Ok	th	tTim /	76\m an	d ro oolo	uloto	
the utilis						ed at ste	ер ттог	rable 90	o, so tha	t II,m=(ro)m an	d re-calc	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	on facto	or for g	ains, hm	:										
(94)m=	0.99	0.97	0.92	0.77	0.57	0.38	0.26	0.31	0.56	0.88	0.98	0.99		(94)
Useful g	gains, h	mGm ,	W = (94)	4)m x (84	1)m									
(95)m= 84	41.56	1129.32	1378.95	1455.57	1231.61	835.27	539.4	567.76	880.87	1054.99	879.53	769.46		(95)
Monthly	averaç	ge exte	rnal tem	perature	from Ta	able 8						, ,		
` ′	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 los							- ` 		<u> </u>			1		
(97)m= 24						844.24	540.67	570.32	922.71		2004.81	2458.88		(97)
Space h														
(98)m= 12	205.47	829.74	545.39	194.32	46.5	0	0	0	0	303.16	810.2	1256.93		٦,,,,,
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	5191.72	(98)
Space h	neating	require	ement in	kWh/m²	/year								48.34	(99)
9a. Energ			ıts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space h	-				./							Г		7(004)
Fraction	•					mentary	•	(222)	(1)			ļ	0	(201)
Fraction	•			•	` ,			(202) = 1 -	` '			ļ	1	(202)
Fraction	of tota	al heatir	ng from i	main sys	stem 1			(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficienc	cy of m	ain spa	ce heat	ing syste	m 1								205.31	(206)
Efficienc	cy of se	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
Space h	neating	require	ement (c	alculate	d above)									
12	205.47	829.74	545.39	194.32	46.5	0	0	0	0	303.16	810.2	1256.93		
(211)m =	: {[(98)r	n x (20	4)] } x 1	00 ÷ (20	6)									(211)
58	87.15	404.15	265.65	94.65	22.65	0	0	0	0	147.66	394.63	612.22		
	•							Tota	l (kWh/yea	ar) =Sum(2		=	2528.75	(211)
Space h	neating	fuel (se	econdar	y), kWh/	month							Į.		_
= {[(98 <u>)</u> m	_													
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	I (kWh/yea	ar) =Sum(2		-	0	(215)
												-		

Water heating																
Output from water heater (calculated above)																
193.4 169.99 177.4 157.46 153.17	135.24	128.33	142.96	143.37	163.35	174.7	188.22		_							
Efficiency of water heater								100	(216)							
(217)m= 100 100 100 100 100	100	100	100	100	100	100	100		(217)							
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m																
(219)m= 193.4 169.99 177.4 157.46 153.17	135.24	128.33	142.96	143.37	163.35	174.7	188.22		_							
			Tota	I = Sum(2	19a) ₁₁₂ =			1927.59	(219)							
Annual totals					k۱	Nh/year		kWh/year	7							
Space heating fuel used, main system 1								2528.75								
Water heating fuel used	1927.59															
Electricity for pumps, fans and electric keep-hot									_							
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			0	(231)							
Electricity for lighting								421.58	(232)							
Electricity generated by PVs								-778.07	(233)							
12a. CO2 emissions – Individual heating syste	ms inclu	ding mi	cro-CHP													
12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor Emissions																
		e rgy h/year			Emiss kg CO2	-	tor	Emissions kg CO2/yea	ar							
Space heating (main system 1)		h/year				2/kWh	tor =		ar](261)							
Space heating (main system 1) Space heating (secondary)	kWl	h/year			kg CO2	2/kWh		kg CO2/yea	_							
• • • • • • • • • • • • • • • • • • • •	kWł (211)	h/year) x) x			kg CO2	2/kWh	=	kg CO2/yea	(261)							
Space heating (secondary)	(211) (215) (219)	h/year x x	+ (263) + (0.5°	2/kWh	= =	1312.42	(261)							
Space heating (secondary) Water heating	(211) (215) (219) (261)	h/year) x) x) x) x) + (262) -	+ (263) + (0.5°	2/kWh	= =	kg CO2/yea 1312.42 0 1000.42	(261) (263) (264)							
Space heating (secondary) Water heating Space and water heating	(211) (215) (219) (261)	h/year) x) x) x) + (262) -	+ (263) + (0.57	2/kWh	= = =	kg CO2/yea 1312.42 0 1000.42 2312.84	(261) (263) (264) (265)							
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) (215) (219) (261) (231)	h/year) x) x) x) + (262) -	+ (263) + (0.5°	2/kWh	= = = = =	0 1000.42 2312.84	(261) (263) (264) (265) (267)							

 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

19.81

81

		Us	er Details:					
Assessor Name:	Su Lee		Strom	a Num	ber:	STRO	031315	
Software Name:	Stroma FSAP 201	2	Softw	are Ve	rsion:	Versio	n: 1.0.4.16	
			erty Address					
Address :	138-140 Highgate R	oad, Highga	ate, Highgat	e, NW5 ′	1PB			
Overall dwelling dime	nsions:		A		Ass Hadalat	()	Malana (22.2	
Basement		ſ	40.51	(1a) x	Av. Height	(2a) =	Volume(m³	(3a)
Ground floor		Γ	35.41	(1b) x	3.2	(2b) =	113.31	(3b)
First floor		Ī	32.25	(1c) x	4.65	(2c) =	149.96	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	108.17	(4)				
Dwelling volume		_		(3a)+(3b)+(3c)+(3d)+(3e	e)+(3n) =	372.65	(5)
2. Ventilation rate:								
		econdary eating	other		total		m³ per hou	.r
Number of chimneys	0 +	0 +	0	_ = [0	x 40 =	0	(6a)
Number of open flues	0 +	0	0	_ = [0	x 20 =	0	(6b)
Number of intermittent fa	ns				5	x 10 =	50	(7a)
Number of passive vents					0	x 10 =	0	(7b)
Number of flueless gas fi	res				0	x 40 =	0	(7c)
						Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6	a)+(6b)+(7a)+(7	7b)+(7c) =	Γ	50	÷ (5) =	0.13	(8)
If a pressurisation test has b	een carried out or is intende	d, proceed to (17), otherwise	continue fr	rom (9) to (16)	L		
Number of storeys in the	ne dwelling (ns)						0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0				•	ruction		0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value correspons): if equal user 0.35	oonding to the	greater wall are	ea (after				
If suspended wooden f	= :	ed) or 0.1 (s	ealed), else	enter 0		[0	(12)
If no draught lobby, en	ter 0.05, else enter 0					Ī	0	(13)
Percentage of windows	s and doors draught st	ripped				Ī	0	(14)
Window infiltration	_		0.25 - [0.3	2 x (14) ÷ 1	100] =	ĺ	0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) + (15)	=	0	(16)
Air permeability value,	q50, expressed in cub	ic metres pe	er hour per s	quare m	etre of envel	ope area	4	(17)
If based on air permeabil	ity value, then (18) = [(1	7) ÷ 20]+(8), ot	herwise (18) =	(16)		Ì	0.33	(18)
Air permeability value applie	s if a pressurisation test has	been done or	a degree air pe	ermeability	is being used	ı		_
Number of sides sheltere	d						2	(19)
Shelter factor			(20) = 1 -	[0.075 x (²	19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18	3) x (20) =		[0.28	(21)
Infiltration rate modified f	or monthly wind speed							
Jan Feb	Mar Apr May	Jun J	ul Aug	Sep	Oct N	lov Dec		
Monthly average wind sp	eed from Table 7							

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (22	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>	<u> </u>			
Adjusted infiltra		`				` 	r `	ì ´	I 0.04				
0.36 Calculate effect	0.36 tive air (0.35 Change	0.31 rate for t	0.31 he appli	0.27 cable ca	0.27 S e	0.26	0.28	0.31	0.32	0.33		
If mechanical		-			- C.I.O. T. G. G.							0	(23a)
If exhaust air hea	at pump ι	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(23b)
If balanced with I	heat reco	very: effic	iency in %	allowing for	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balanced	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	I – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		· ,	<u> </u>		<u> </u>	· ` `	ŕ		· ` ·				(0.1.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v									0.51				
(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		(24d)
Effective air o						<u> </u>	<u> </u>						
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
3 Heat losses	and he	at loss r	naramete	ar.									
3. Heat losses ELEMENT	Gros	ss	Openin	gs	Net Ar		U-valı W/m2		A X U	<)	k-value		A X k
ELEMENT		ss		gs	A ,r	n²	W/m2	k 	(W/I	<) 	k-value kJ/m²-ł		kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m² x	W/m2 1.4	2K =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area	ss	Openin	gs	A ,r 2.46 4.86	m ² x x x 1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] =	(W/I 3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1	ss	Openin	gs	A ,r 2.46 4.86 5.21	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	<) 			(26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86 6.44	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 2 1	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 2 1	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 9 1 9 2 9 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 2 1	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 9 1 9 2 9 3	es (m²)	Openin	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663				(26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	9 3	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663 1.54				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (29) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 1 2 3 10.2	9 3	Openin m	gs 2	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 40.51 10.29 0.22	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.2663 1.54 0.03				(26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8	0.15 =	0.12			(29)
Walls Type7 0.96 0	0.96	0.15 =	0.14			(29)
Walls Type8 6.02 0	6.02	0.15	0.9			(29)
Walls Type9 4.96 0	4.96	0.15	0.74			(29)
Walls Type10 5.76 4.86	0.9	0.15	0.14			(29)
Walls Type11 0.42 0	0.42	0.15	0.06			(29)
Walls Type12 6.4 0	6.4	0.15 =	0.96			(29)
Walls Type13 9.11 5.29	3.82	0.15	0.57			(29)
Walls Type14 1.86 0	1.86	0.15	0.28			(29)
Walls Type15 8.6 2.46	6.14	0.15	0.92			(29)
Walls Type16 9.3 0	9.3	0.15	1.4			(29)
Walls Type17 0.6 0	0.6	0.15	0.09			(29)
Walls Type18 8.37 4.86	3.51	0.15	0.53			(29)
Roof Type1 31.76 4.5	27.26	0.13 =	3.54			(30)
Roof Type2 3.31 0.98	2.33	0.13 =	0.3			(30)
Total area of elements, m ²	166.94					(31)
Party wall	29.24	0 =	0			(32)
Party wall	28.24	0 =	0			(32)
Party wall	32.58	0 =	0			(32)
Party wall	33.47	0 =	0			(32)
Party wall	38.73	0 =	0			(32)
Party wall	40	0 =	0			(32)
* for windows and roof windows, use effective window ** include the areas on both sides of internal walls and		ng formula 1/[(1/U-val	ue)+0.04] as given ir	n paragraph :	3.2	
Fabric heat loss, $W/K = S (A \times U)$,	(26)(30) + (32) =		Г	70.51	(33)
Heat capacity Cm = S(A x k)		((28)	(30) + (32) + (32a)	(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA	a) in kJ/m²K	Indica	ative Value: Medium	Ī	250	(35)
For design assessments where the details of the const	ruction are not known	precisely the indicativ	e values of TMP in T	able 1f		
can be used instead of a detailed calculation. Thermal bridges: S(L x Y) calculated using	Annendiy K			г	45.0	(36)
if details of thermal bridging are not known (36) = 0.15	• •			L	15.9	(30)
Total fabric heat loss	, ,	(33) -	+ (36) =		86.41	(37)
Ventilation heat loss calculated monthly		(38)n	$n = 0.33 \times (25) \text{m} \times (5)$	5)		
 	ay Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 69.55 69.24 68.93 67.49 67.2	22 65.96 65.96	65.73 66.45	67.22 67.77	68.34		(38)
Heat transfer coefficient, W/K		(39)n	n = (37) + (38)m			
(39)m= 155.96 155.65 155.34 153.9 153.	63 152.37 152.37	7 152.14 152.86	153.63 154.17	154.74		-
Heat loss parameter (HLP), W/m²K		(40)n	Average = Sum(39) $n = (39)m \div (4)$	112 /12=	153.9	(39)
(40)m= 1.44 1.44 1.42 1.4	2 1.41 1.41	1.41 1.41	1.42 1.43	1.43		
Number of days in month (Table 1a)	<u>, </u>		Average = Sum(40)	112 /12=	1.42	(40)
	ay Jun Jul	Aug Sep	Oct Nov	Dec		
	· 1 · ·	<u>, </u>	1			

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		-			-								
4. Water heat	ing 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 (1	ΓFA -13.		.8		(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).78		(43)
Jan Hot water usage ii	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	106.83	102.8	98.76	94.73	90.7	90.7	94.73	98.76	102.8	106.83	110.86		
(44)m= 110.86	100.03	102.0	90.70	94.73	90.7	90.7	94.73		Fotal = Su			1209.36	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,n	n x nm x E	Tm / 3600			. ,		1200.00	J ()
(45)m= 164.4	143.79	148.37	129.36	124.12	107.11	99.25	113.89	115.25	134.31	146.61	159.21		
If instantaneous w	ater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =		1585.67	(45)
(46)m= 24.66	21.57	22.26	19.4	18.62	16.07	14.89	17.08	17.29	20.15	21.99	23.88		(46)
Water storage		inaludin	a ony o	olor or M	WHE	otorogo	within o	ama vaa	aal				(47)
Storage volum	, ,		•			•		ame ves	sei		210		(47)
If community hours of therwise if no	_			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage		not mate	, (u.i.o ii	.0.000	notanta.	.0000		0.0, 0	, , , , , ,	,			
a) If manufact	urer's de	eclared I	oss facto	or is kno	wn (kWh	n/day):				1.	57		(48)
Temperature fa	actor fro	m Table	2b							0	.6		(49)
Energy lost fro b) If manufact		_	-		or is not		(48) x (49)) =		0.	94		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee secti	on 4.3										
Volume factor											0		(52)
Temperature f											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (5	53) =	-	0		(54)
Enter (50) or (, ,	,	for ooob	manth			(/EC) /	EE) (44)*	_	0.	94		(55)
Water storage							·· ·	55) × (41)r					(50)
(56)m= 29.2 If cylinder contains	26.38 dedicate	29.2 d solar sto	28.26 rage, (57)	29.2 m = (56)m	28.26 x [(50) – (29.2 H11)] ÷ (5	29.2 0), else (5	28.26 7)m = (56)	29.2 m where (28.26 H11) is fro	29.2 m Append	ix H	(56)
(57)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(57)
Primary circuit	loss (ar	nual) fro	m Table	. 3	l						0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m			<u> </u>		()
(modified by				,	•	,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.6	170.16	177.58	157.62	153.32	135.37	128.45	143.09	143.51	163.52	174.87	188.41		(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)													
(add additional lines if FGHI	RS and/or	WWHRS	applies	s, see Ap	pend	dix G)							
(63)m= 0 0 0	0	0	0	0	0)	0	0	0	0		(63)	
Output from water heater													
(64)m= 193.6 170.16 177.	58 157.62	153.32	135.37	128.45	143	.09 1	43.51	163.52	174.87	188.41			
	-	•		-		Output	from wa	ter heat	er (annual) ₁	12	1929.5	(64)	
Heat gains from water heati	ng, kWh/r	nonth 0.2	5 ´ [0.85	5 × (45)m	+ (6	51)m] +	+ 0.8 x	[(46)n	n + (57)m	+ (59)m]		
(65)m= 78.02 68.91 72.	7 65.62	64.63	58.22	56.36	61.	23 6	60.93	68.02	71.36	76.3		(65)	
include (57)m in calculation	on of (65)	n only if c	ylinder	is in the	dwell	ing or	hot wa	ater is	from com	munity h	neating		
5. Internal gains (see Tabl	e 5 and 5	a):											
Metabolic gains (Table 5), V	Vatts												
Jan Feb Ma		May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec			
(66)m= 140.17 140.17 140.	17 140.17	140.17	140.17	140.17	140	.17 1	40.17	140.17	140.17	140.17		(66)	
Lighting gains (calculated in	Appendix	L, equat	ion L9 c	or L9a), a	lso s	ee Ta	ble 5		•		•		
(67)m= 23.97 21.29 17.3	2 13.11	9.8	8.27	8.94	11.	62	15.6	19.8	23.11	24.64		(67)	
Appliances gains (calculate	d in Appe	ndix L, eq	uation L	13 or L1	3a),	also s	ee Tab	le 5		-			
(68)m= 268.9 271.69 264.	66 249.69	230.79	213.03	201.17	198	.38 2	05.41	220.38	239.28	257.04		(68)	
Cooking gains (calculated in	Appendi	x L, equa	tion L15	or L15a), als	o see	Table	5	•		•		
(69)m= 37.02 37.02 37.0	2 37.02	37.02	37.02	37.02	37.	02 3	37.02	37.02	37.02	37.02		(69)	
Pumps and fans gains (Tab	le 5a)	•	•	•					•		•		
(70)m= 0 0 0	0	0	0	0	0)	0	0	0	0		(70)	
Losses e.g. evaporation (ne	gative val	ues) (Tab	le 5)	•	•	•	•		•		•		
(71)m= -112.14 -112.14 -112.	14 -112.14	-112.14	-112.14	-112.14	-112	.14 -1	12.14	-112.14	-112.14	-112.14		(71)	
Water heating gains (Table	5)												
(72)m= 104.87 102.54 97.7	1 91.14	86.87	80.86	75.76	82	.3 8	84.62	91.43	99.11	102.55		(72)	
Total internal gains =			(66	6)m + (67)m	1 + (68	3)m + (6	69)m + (7	70)m +	(71)m + (72)	m			
(73)m= 462.8 460.58 444.	74 418.99	392.51	367.22	350.91	357	.35 3	70.68	396.66	426.55	449.28		(73)	
6. Solar gains:													
Solar gains are calculated using s				•	tions	to conve	ert to the	applica		ion.			
Orientation: Access Factor Table 6d	Are m ²		Flu	ux ible 6a		g. Tab	_ ole 6b		FF Table 6c		Gains (W)		
N. 11					1							-	
Northeast 0.9x 0.77		.29		11.28	X).76	x	0.7	=	22.01	(75)	
Northeast 0.9x 0.77		.29	-	11.28	X	_).76	X	0.7	=	22.01	(75)	
Northeast 0.9x 0.77		5.29		22.97	X).76	_ X	0.7	=	44.79	(75)	
Northeast 0.9x 0.77		.29	x	22.97	X	0).76	X	0.7	=	44.79	<u> </u> (75)	
Northeast 0.9x 0.77		.29	X	41.38	X	0).76	x [0.7	=	80.7	<u> </u> (75)	
Northeast 0.9x 0.77		.29		41.38	X		.76	_ x [0.7	=	80.7	(75)	
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 = 132.53 (75)													
Northeast 0.9x 0.77	X 5	.29	-	67.96	X	0).76	_ x	0.7	=	132.53	(75)	
Northeast 0.9x 0.77		.29	x	91.35	X	0).76	x	0.7	=	178.15	(75)	
Northeast _{0.9x} 0.77	X 5	.29	X	91.35	X	0).76	X	0.7	=	178.15	(75)	

Northeast _{0.9x}	0.77] x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]]	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] X	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7	=	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7] =	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Rooflights 0.9x		—		一.	. —		1 .,	0.70	ا ا		_	45.05	(00)
Rooflights 0.9x	1	X	0.98	╣,		96] X	0.76	X	0.7	_ =	45.05	(82)
	1	×	3.37	┥ '		150	X	0.76	×	0.7	_ =	242.03	(82)
Rooflights 0.9x	1	×	1.13	┥ '		150] X]	0.76	×	0.7	=	81.16	(82)
Rooflights 0.9x	1	×	0.98	╡ '	_	150	X	0.76	×	0.7	=	70.38	(82)
Rooflights 0.9x	1	X	3.37	,	(192	X	0.76	×	0.7	=	309.8	(82)
Rooflights 0.9x	1	X	1.13	,	·	192	X	0.76	X	0.7	=	103.88	(82)
Rooflights 0.9x	1	X	0.98			192	X	0.76	X	0.7	=	90.09	(82)
Rooflights _{0.9x}	1	X	3.37		()	200	X	0.76	X	0.7	=	322.71	(82)
Rooflights 0.9x	1	X	1.13)	()	200	X	0.76	X	0.7	=	108.21	(82)
Rooflights 0.9x	1	X	0.98	,	(200	X	0.76	X	0.7	=	93.84	(82)
Rooflights 0.9x	1	X	3.37)		189	X	0.76	X	0.7	=	304.96	(82)
Rooflights 0.9x	1	X	1.13			189	x	0.76	X	0.7	=	102.26	(82)
Rooflights 0.9x	1	X	0.98	,	(189	x	0.76	x	0.7	=	88.68	(82)
Rooflights _{0.9x}	1	x	3.37	= ,	(157	x	0.76	x	0.7	_ =	253.33	(82)
Rooflights 0.9x	1	х	1.13	╡,	,	157	x	0.76	x	0.7	=	84.94	(82)
Rooflights _{0.9x}	1	x	0.98	╡,	,	157	x	0.76	x	0.7		73.67	(82)
Rooflights _{0.9x}	1	x	3.37	= ,	,	115	X	0.76	×	0.7	_ =	185.56	(82)
Rooflights _{0.9x}	1	x	1.13	= ,	,	115	X	0.76	X	0.7	=	62.22	(82)
Rooflights _{0.9x}	1	×	0.98	╡,	,	115] x	0.76	×	0.7		53.96	(82)
Rooflights _{0.9x}	1	x	3.37	╡,	-	66]]	0.76	- x	0.7	╡ -	106.49	(82)
Rooflights 0.9x	<u>·</u> 1	x	1.13	╡,		66]]	0.76	_	0.7	=	35.71	(82)
Rooflights 0.9x	<u>·</u> 1	×	0.98	╡,		66	」] x	0.76	_ x	0.7	= =	30.97	(82)
Rooflights 0.9x	1	X	3.37	╡;		33] ^] _X	0.76		0.7	= =	53.25	(82)
Rooflights 0.9x	1	T x	1.13	╣,		33] ^] _x	0.76	^ x	0.7		17.85	(82)
Rooflights 0.9x	1		0.98	╣,		33] ^] _x	0.76	^ x	0.7		15.48	(82)
Rooflights 0.9x	1			\exists ,	-		」^] x		-		= =		(82)
Rooflights 0.9x		=	3.37	=		21	1	0.76	╡╏	0.7	=	33.88	(82)
Rooflights 0.9x	1	X	1.13	╣,		21] X]	0.76	X	0.7	_ =	11.36	= ' '
Tooliights 0.9x	1	X	0.98		·	21	Х	0.76	X	0.7	=	9.85	(82)
Color going in	watta aal	ouloto d	for each me	n th			(02)~	Cum/74)m	(00)~				
Solar gains in (83)m= 386.5			1468.94 177		1816.92	1729.37		1 = Sum(74)m. 1.36 1201.89	802.52	470.83	325.54	1	(83)
Total gains – in	<u> </u>						1	1.00	002.02	170.00	020.01]	()
(84)m= 849.3			1887.93 216		<u> </u>		185	1.7 1572.57	1199.1	8 897.38	774.81]	(84)
` ′	<u> </u>												
7. Mean inter		,			a oroo t	rom Tol	hla O	Th4 (9C)					(85)
Temperature	•	٠.			_		bie 9	, IIII (C)				21	(65)
Utilisation fac				-	`		Ι	Com	0 0 0 1	Nev	Dag	1	
Jan	Feb	Mar	<u> </u>	lay	Jun	Jul	 	ug Sep	Oct	Nov	Dec	-	(86)
(86)m= 0.99	0.98	0.93	0.8 0.0		0.44	0.32	0.3		0.91	0.99	1	J	(00)
Mean interna				<u> </u>			1	<u> </u>				1	
(87)m= 21	21	21	21 2	:1	21	21	2	1 21	21	21	21		(87)
Temperature	during he	ating pe	eriods in res	t of c	lwelling	from Ta	able 9	9, Th2 (°C)					
(88)m= 19.73	19.73	19.74	19.75 19	.75	19.76	19.76	19.	76 19.75	19.75	19.74	19.74		(88)
												-	

Utilisatio	n factor	for ac	nine for I	oct of d	volling k	2 m (cc	o Tablo	00)						
		0.97	0.91	0.76	0.55	0.36	0.23	9a) 0.28	0.53	0.87	0.98	0.99		(89)
` /	!										0.90	0.99		(00)
Mean int	- 1	9.73	19.74	19.75	ot awelli	ng 12 (fo 19.76	19.76	19.76	7 IN T abi	e 9c) 19.75	19.74	19.74		(90)
(50)111=	5.75	5.75	10.74	13.75	13.75	13.70	13.70	15.70		LA = Livin		L	0.33	(91)
											3 (' [0.55	
Mean int						<u> </u>								(00)
` ′		0.15	20.15	20.16	20.16	20.17	20.17	20.17	20.16	20.16	20.16	20.15		(92)
Apply ac		10.15	ne mean 20.15	20.16	tempera 20.16	20.17	m Table		20.16	20.16	20.16	20.45		(93)
` '				20.16	20.16	20.17	20.17	20.17	20.16	20.16	20.16	20.15		(93)
8. Space		•		mmoratur	o obtoin	ad at at	on 11 of	Tabla Ol	th	tTim /	76\m an	d ro oolo	uloto	
Set Ti to the utilis				•		ed at ste	ер ттог	rable 9	o, so tha	t II,m=(76)m an	a re-caic	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	n factor	for ga	ains, hm	:										
(94)m = 0	0.99 (0.97	0.92	0.77	0.57	0.38	0.26	0.31	0.56	0.88	0.98	0.99		(94)
Useful g					4)m		1							
(95)m= 84	43.07 1	131.2	1381.83	1460.1	1236.47	838.95	541.98	570.44	884.5	1057.65	881.07	770.88		(95)
Monthly														
` ′		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los							- ` 	- ,	<u> </u>					(07)
(97)m= 24						848	543.25	573.02	926.77			2468.79		(97)
Space h												4000.05		
(98)m= 12	211.69 83	34.87	549.62	196.19	46.96	0	0	0	0	305.73	814.99	1263.25		٦,,,,,,
					.,			lota	l per year	(kWh/year) = Sum(9	8) _{15,912} = [5223.31	<u> </u> (98)
Space h	eating r	equire	ement in	kvvn/m²	/year							l	48.29	(99)
9a. Energ			ts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space h	_		4 fua ma a .		./aa.a.la.							Г		7(004)
Fraction	•			_		mentary	-	(000)	(004)			ļ	0	(201)
Fraction	•			•	` ,			(202) = 1 -	` '			ļ	1	(202)
Fraction	of total	heatir	ng from i	main sys	stem 1			(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficienc	cy of ma	in spa	ce heati	ng syste	em 1								205.74	(206)
Efficienc	cy of sec	condar	y/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	eating r	equire	ment (c	alculated	d above)									
12	211.69 83	34.87	549.62	196.19	46.96	0	0	0	0	305.73	814.99	1263.25		
(211)m =	{[(98)m	x (20	4)] } x 1	00 ÷ (20	6)									(211)
58	88.94 40	05.79	267.14	95.36	22.83	0	0	0	0	148.6	396.13	614		
	•	•						Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	2538.78	(211)
Space h	eating fo	uel (se	econdar	y), kWh/	month							L		_
= {[(98 <u>)</u> m	_	•												
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
							· · ·	Tota	I (kWh/yea	ar) =Sum(2	215),,,,5,10,12	=	0	(215)
												_		

Water heating													
Output from water heater (calculated above) 193.6 170.16 177.58 157.62 153.32 1	35.37 128.45	143.09	143.51	163.52	174.87	188.41							
Efficiency of water heater	I	<u> </u>		ļ.	<u> </u>	Į.	100	(216)					
(217)m= 100 100 100 100 100	100 100	100	100	100	100	100		(217)					
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m= 193.6 170.16 177.58 157.62 153.32 1	35.37 128.45	143.09	143.51	163.52	174.87	188.41		_					
		Tota	I = Sum(2	19a) ₁₁₂ =			1929.5	(219)					
Annual totals				k\	Wh/year	•	kWh/year	¬					
Space heating fuel used, main system 1 Water heating fuel used 1929.5													
Electricity for pumps, fans and electric keep-hot													
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			0	(231)					
Electricity for lighting							423.36	(232)					
Electricity generated by PVs							-778.07	(233)					
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						
Space heating (main system 1)	(211) x			0.5	19	=	1317.63	(261)					
Space heating (secondary)	(215) x			0.5	19	=	0	(263)					
Water heating	(219) x			0.5	19	=	1001.41	(264)					
Space and water heating	(261) + (262)	+ (263) + (264) =				2319.04	(265)					
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	0	(267)					
Electricity for lighting	(232) x			0.5	19	=	219.73	(268)					
Energy saving/generation technologies Item 1				0.5	19	=	-403.82	(269)					

 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

19.74

81

		User Details:				
Assessor Name:	Su Lee	Stroma Num	nber:	STRO	031315	
Software Name:	Stroma FSAP 2012	Software Ve	rsion:	Versio	n: 1.0.4.16	
	Pro	perty Address: Unit 04	4			
Address :	138-140 Highgate Road, High	igate, Highgate, NW5	1PB			
1. Overall dwelling dime	ensions:				(a)	
Basement		Area(m²) 41.19 (1a) x	Av. Height(m)	(2a) =	Volume(m³)	(3a)
Ground floor		35.68 (1b) x	3.2	$\begin{bmatrix} (2b) & = \end{bmatrix}$	114.18	」 (3b)
First floor		32.25 (1c) x	4.65	(2c) = [149.96] (3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	109.12 (4)		l L		_
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+	.(3n) =	375.35	(5)
2. Ventilation rate:				_		
	main secondary heating heating	other	total		m³ per hour	•
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		5 x 1	0 =	50	(7a)
Number of passive vents			0 x 1	0 =	0	(7b)
Number of flueless gas fi	res		0 x 4	10 =	0	(7c)
				Air cha	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	50	÷ (5) =	0.13	(8)
	een carried out or is intended, proceed t	to (17), otherwise continue t	from (9) to (16)	-		_
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0	•	ruction	L	0	(11)
if both types of wall are pi deducting areas of openir	resent, use the value corresponding to things); if equal user 0.35	ne greater wall area (after				
= -	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		Γ	0	(12)
If no draught lobby, en	ter 0.05, else enter 0			Ī	0	(13)
Percentage of windows	s and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	Ī	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square n	netre of envelope	area	4	(17)
If based on air permeabil	ity value, then $(18) = [(17) \div 20] + (8)$,	otherwise (18) = (16)		Ī	0.33	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeability	is being used	_		_
Number of sides sheltere	ed				2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	[19)] =	L	0.85	(20)
Infiltration rate incorporat	ting shelter factor	(21) = (18) x (20) =		[0.28	(21)
Infiltration rate modified f	or monthly wind speed	, ,	, ,			
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov	Dec		
Monthly average wind sp	eed from Table 7					

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>	<u> </u>			
Adjusted infiltra		· · · · · ·				. 	`´	`´			0.00		
0.36 Calculate effec	0.35 ctive air	0.35 Change	0.31 rate for t	0.3 he appli	0.27 Cable ca	0.27 S e	0.26	0.28	0.3	0.32	0.33		
If mechanica		-			- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	heat reco	very: effic	iency in %	allowing for	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [′	l – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		<u> </u>	<u> </u>		<u> </u>	· ` `	ŕ		· ` ·				(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(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		(24d)
Effective air			<u> </u>			<u> </u>	<u> </u>						
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
									•				
3 Heat Insses	s and he	at Ince i	naramete	or.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value	<u>.</u>	AXk
3. Heat losses		SS	oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				K)			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	K)			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 4.86	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.46 4.86 5.21	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	K)			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86 6.44	K)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	K)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	K)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 e 1	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 3	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547 1.54 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3 10.2 1.38	ss (m²)	0 4.86	gs 2	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19 10.29 0.22 -0.05	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547 1.54 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Windows Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	9 3 1	Openin m	gs ²	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.19 10.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3547 1.54 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6 0.8 0	0.8 ×	0.15	0.12			(29)
Walls Type7 0.96 0	0.96 ×	0.15	0.14			(29)
Walls Type8 6.62 0	6.62 ×	0.15	0.99			(29)
Walls Type9 4.96 0	4.96 ×	0.15	0.74			(29)
Walls Type10 5.76 4.86	0.9 ×	0.15	0.14			(29)
Walls Type11 0.42 0	0.42 ×	0.15	0.06			(29)
Walls Type12 6.4 0	6.4 ×	0.15	0.96			(29)
Walls Type13 9.11 5.29	3.82 ×	0.15	0.57			(29)
Walls Type14 1.86 0	1.86 ×	0.15	0.28			(29)
Walls Type15 8.6 2.46	6.14 ×	0.15	0.92			(29)
Walls Type16 9.3 0	9.3 ×	0.15	= 1.4			(29)
Walls Type17 0.6 0	0.6 ×	0.15	= 0.09			(29)
Walls Type18 8.37 4.86	3.51 ×	0.15	= 0.53			(29)
Roof Type1 31.76 4.5	27.26 ×	0.13	3.54			(30)
Roof Type2 3.67 0.98	2.69 x	0.13	= 0.35		ī 💳	(30)
Total area of elements, m ²	168.58				<u> </u>	(31)
Party wall	29.65 ×	0 =	= 0		1	(32)
Party wall	28.67 ×	(0 =	= 0		i 💳	(32)
Party wall	33.12 ×	(0 =	= 0		i 💳	(32)
Party wall	34.08 ×	(0 =	= 0		i 💳	(32)
Party wall	38.73 ×	(0 =	= 0		ī Ē	(32)
Party wall	40 x	(0 =	= 0		ī Ē	(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa		ng formula 1/[(1/U-v	alue)+0.04] as given i	in paragraph 3	3.2	
Fabric heat loss, W/K = S (A x U)	Tution C	(26)(30) + (32)	=	Г	70.74	(33)
Heat capacity Cm = S(A x k)		((28	3)(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indi	icative Value: Medium	,	250	(35)
For design assessments where the details of the construct	ction are not known į	precisely the indicat	ive values of TMP in	Table 1f		
can be used instead of a detailed calculation. Thermal bridges: S(L x Y) calculated using A	nnendiy K			Г	15.07	(36)
if details of thermal bridging are not known (36) = 0.15×10^{-2}	• •			L	15.97	(30)
Total fabric heat loss	,	(33) + (36) =	Γ	86.7	(37)
Ventilation heat loss calculated monthly		(38	$m = 0.33 \times (25) m \times$	5)		_
Jan Feb Mar Apr May	Jun Jul	Aug Se	Oct Nov	Dec		
(38)m= 70.01 69.7 69.39 67.94 67.67	66.42 66.42	66.18 66.9	67.67 68.22	68.79		(38)
Heat transfer coefficient, W/K		(39	m = (37) + (38)m			
(39)m= 156.71 156.4 156.09 154.65 154.38	153.12 153.12	2 152.89 153.6	5 154.38 154.92	155.5		_
Heat loss parameter (HLP), W/m²K		(40	Average = Sum(39) $m = (39)m \div (4)$)112 /12=	154.65	(39)
(40)m= 1.44 1.43 1.43 1.42 1.41	1.4 1.4	1.4 1.41		1.42		
Number of days in month (Table 1a)			Average = Sum(40))112 /12=	1.42	(40)
Jan Feb Mar Apr May	Jun Jul	Aug Sei	o Oct Nov	Dec		
Can I too I mai I hai	1 5311 541	19 00	2 300 1400	1 200		

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•	•					•					ı	
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		81		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the a	lwelling is	designed			se target of).92		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 111.02	106.98	102.94	98.91	94.87	90.83	90.83	94.87	98.91	102.94	106.98	111.02		٦
Energy content o	f hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600		Total = Sur oth (see Ta	· /		1211.09	(44)
(45)m= 164.63	143.99	148.59	129.54	124.3	107.26	99.39	114.05	115.41	134.5	146.82	159.44		
If instantaneous v	vater heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Γotal = Sur	m(45) ₁₁₂ =		1587.93	(45)
(46)m= 24.7	21.6	22.29	19.43	18.64	16.09	14.91	17.11	17.31	20.18	22.02	23.92		(46)
Water storage		. : :		-1 \^	/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	_1						! !	
Storage volun	` '		•			_		ame ves	sel		210		(47)
If community I Otherwise if n	_			_			` '	ers) ente	er '0' in (4	47)			
Water storage			(,		,			
a) If manufac	turer's d	eclared I	oss fact	or is kno	wn (kWł	n/day):				1.	57		(48)
Temperature	factor fro	m Table	2b							0	.6		(49)
Energy lost from b) If manufac		•			or is not		(48) x (49)) =		0.	94		(50)
Hot water stor			,								0		(51)
If community I			on 4.3									•	
Volume factor			Oh								0		(52)
Temperature								. (==) (>		0		(53)
Energy lost from Enter (50) or		_	, KVVh/y	ear			(47) X (51)) x (52) x (53) =	-	0		(54) (55)
Water storage	. , .	•	for each	month			((56)m = ((55) × (41)ı	m	0.	94		(55)
(56)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(56)
If cylinder contain												l ix H	(==)
(57)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(57)
Primary circui	t loss (ar	nnual) fro	om Table	÷ 3			•	•			0		(58)
Primary circui	,	•			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified by	/ factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
			~~				`				<u> </u>	(59)m + (61)m	
(62)m= 193.84	170.37	177.79	157.8	153.5	135.52	128.59	143.25	143.67	163.71	175.08	188.64		(62)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 (63) Output from water heater
Output from water heater
(64)m= 193.84 170.37 177.79 157.8 153.5 135.52 128.59 143.25 143.67 163.71 175.08 188.64
Output from water heater (annual) ₁₁₂ 1931.76 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]
(65)m= 78.1 68.98 72.77 65.68 64.69 58.27 56.41 61.28 60.98 68.08 71.43 76.38 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating
5. Internal gains (see Table 5 and 5a):
Metabolic gains (Table 5), Watts
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m= 140.47 140.47 140.47 140.47 140.47 140.47 140.47 140.47 140.47 140.47 140.47 140.47 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
(67)m= 24.1 21.4 17.41 13.18 9.85 8.32 8.99 11.68 15.68 19.9 23.23 24.77 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
(68)m= 270.29 273.09 266.02 250.98 231.98 214.13 202.21 199.4 206.47 221.52 240.51 258.36 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m= 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 (69)
Pumps and fans gains (Table 5a)
(70)m =
Losses e.g. evaporation (negative values) (Table 5)
(71)m= -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 -112.38 (71)
Water heating gains (Table 5)
(72)m= 104.98 102.65 97.8 91.22 86.95 80.93 75.82 82.37 84.7 91.51 99.2 102.65 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
(73)m= 464.5 462.28 446.37 420.52 393.92 368.52 352.15 358.59 371.99 398.07 428.09 450.92 (73)
6. Solar gains:
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux g_ FF Gains
Table 6d m² Table 6a Table 6b Table 6c (W)
Northeast 0.9x 0.77 x 5.29 x 11.28 x 0.76 x 0.7 = 22.01 (75)
Northeast 0.9x 0.77 x 5.29 x 11.28 x 0.76 x 0.7 = 22.01 (75)
Northeast $0.9x$ 0.77 x 5.29 x 22.97 x 0.76 x 0.7 = 44.79 (75)
Northeast $0.9x$ 0.77 x 5.29 x 22.97 x 0.76 x 0.7 = 44.79 (75)
Northeast $0.9x$ 0.77 x 5.29 x 41.38 x 0.76 x 0.7 = 80.7 (75)
Northeast 0.9x 0.77 x 5.29 x 41.38 x 0.76 x 0.7 = 80.7 (75)
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 = 132.53 (75)
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 = 132.53 (75)
Northeast 0.9x 0.77 x 5.29 x 91.35 x 0.76 x 0.7 = 178.15 (75)
Northeast 0.9x 0.77 x 5.29 x 91.35 x 0.76 x 0.7 = 178.15 (75)

Northeast _{0.9x}	0.77] x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]]	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] x	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7	=	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7	<u> </u>	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Rooflights 0.9x	1	x	0.98] x	96	X	0.76	x	0.7		45.05	(82)
Rooflights 0.9x	1	x	3.37] x	150	X	0.76	x	0.7	=	242.03	(82)
Rooflights 0.9x	1	x	1.13	X	150	X	0.76	x	0.7	=	81.16	(82)
Rooflights 0.9x	1	x	0.98	X	150	X	0.76	x	0.7	=	70.38	(82)
Rooflights 0.9x	1	x	3.37	X	192	X	0.76	x	0.7		309.8	(82)
Rooflights _{0.9x}	1	x	1.13	x	192	X	0.76	x	0.7	=	103.88	(82)
Rooflights 0.9x	1	x	0.98	x	192	X	0.76	x	0.7	=	90.09	(82)
Rooflights 0.9x	1	x	3.37	x	200	X	0.76	x	0.7	=	322.71	(82)
Rooflights 0.9x	1	x	1.13	x	200	X	0.76	x	0.7	=	108.21	(82)
Rooflights 0.9x	1	x	0.98	x	200	X	0.76	x	0.7	=	93.84	(82)
Rooflights 0.9x	1	x	3.37	x	189	X	0.76	x	0.7	=	304.96	(82)
Rooflights 0.9x	1	x	1.13	x	189	X	0.76	x	0.7	=	102.26	(82)
Rooflights 0.9x	1	x	0.98	x	189	X	0.76	x	0.7	=	88.68	(82)
Rooflights 0.9x	1	x	3.37	x	157	X	0.76	x	0.7	=	253.33	(82)
Rooflights 0.9x	1	x	1.13	x	157	X	0.76	x	0.7	=	84.94	(82)
Rooflights 0.9x	1	x	0.98	x	157	j x	0.76	x	0.7	=	73.67	(82)
Rooflights 0.9x	1	x	3.37	x	115	X	0.76	x	0.7	=	185.56	(82)
Rooflights 0.9x	1	x	1.13	x	115	X	0.76	x	0.7	=	62.22	(82)
Rooflights 0.9x	1	x	0.98	x	115	j x	0.76	x	0.7	=	53.96	(82)
Rooflights 0.9x	1	X	3.37	x	66	i x	0.76	x	0.7	=	106.49	(82)
Rooflights 0.9x	1	X	1.13	x	66	X	0.76	x	0.7	=	35.71	(82)
Rooflights _{0.9x}	1	x	0.98	j×	66	j×	0.76	x	0.7		30.97	(82)
Rooflights _{0.9x}	1	x	3.37	×	33	X	0.76	x	0.7	=	53.25	(82)
Rooflights 0.9x	1	x	1.13	X	33	j ×	0.76	x	0.7	=	17.85	(82)
Rooflights 0.9x	1	x	0.98	X	33	Īx	0.76	x	0.7	=	15.48	(82)
Rooflights 0.9x	1	x	3.37	x	21	X	0.76	x	0.7	=	33.88	(82)
Rooflights 0.9x	1	x	1.13	x	21	X	0.76	x	0.7	=	11.36	(82)
Rooflights 0.9x	1	x	0.98	x	21	j x	0.76	x	0.7	=	9.85	(82)
_						_						
Solar gains in	watts, cal	lculated	for each mon	ith_		(83)m	n = Sum(74)m .	(82)m	_		•	
(83)m= 386.5			1468.94 1775.		316.92 1729.37	1494	4.36 1201.89	802.52	2 470.83	325.54		(83)
Total gains – i			· , , , , ,	<u> </u>		_					I	
(84)m= 851	1162.68	1506.68	1889.46 2169.4	46 2 ⁻	85.44 2081.52	1852	2.95 1573.88	1200.5	9 898.92	776.46		(84)
7. Mean inter	nal tempe	erature (heating seas	on)								
Temperature	during he	eating pe	eriods in the li	iving	area from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fac			ving area, h1	,m (s	ee Table 9a)						Ī	
Jan	Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.93	0.81 0.62		0.44 0.32	0.3	0.63	0.91	0.99	1		(86)
Mean interna	l tempera	ture in li	ving area T1	(follo	w steps 3 to	7 in T	able 9c)					
(87)m= 21	21	21	21 21		21 21	2	1 21	21	21	21		(87)
Temperature	during he	eating pe	eriods in rest	of dw	elling from Ta	able 9	9, Th2 (°C)					
(88)m= 19.74	19.74	19.74	19.75 19.75	5 1	9.76 19.76	19.	76 19.76	19.75	19.75	19.74		(88)
												

Utilisation	factor for g	ains for	rest of d	welling l	n2 m (se	e Table	9a)						
(89)m= 0.9		0.91	0.76	0.55	0.36	0.23	0.28	0.53	0.87	0.98	0.99		(89)
Mean inte	rnal tempe	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	L 7 in Tabl	L le 9c)		<u> </u>		
(90)m= 19.		19.74	19.75	19.75	19.76	19.76	19.76	19.76	19.75	19.75	19.74		(90)
		l				<u> </u>	<u> </u>	<u> </u>	fLA = Livin	g area ÷ (4	4) =	0.33	(91)
Moan into	rnal tempei	aturo (fo	or the wh	ala dwal	lling) – fl	ΙΛ ν Τ1	⊥ (1 _ fl	۸) ی T2			l		
(92)m= 20.	_ -	20.16	20.16	20.16	20.17	20.17	20.17	20.17	20.16	20.16	20.16		(92)
(* /	ustment to t									20.10			(-)
(93)m= 20.		20.16	20.16	20.16	20.17	20.17	20.17	20.17	20.16	20.16	20.16		(93)
` ′	neating req	uirement											
Set Ti to t	he mean in	ternal ter	mperatur		ed at ste	ep 11 of	Table 9	o, so tha	ıt Ti,m=(76)m an	d re-calc	ulate	
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	factor for g			Iviay	Odii	l oui	, rug	ССР	000	1407			
(94)m= 0.9	- i	0.92	0.78	0.57	0.39	0.26	0.31	0.56	0.88	0.98	1		(94)
Useful gai	ns, hmGm	, W = (94	4)m x (8 [,]	ـــــــــــــــــــــــــــــــــــــ		l	ı	l	ı		<u> </u>		
(95)m= 844		1385.37		1242.56	843.57	545.2	573.78	889.04	1060.93	882.95	772.62		(95)
Monthly a	verage exte	rnal tem	ıperature	from Ta	able 8	!							
(96)m= 4.3	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= 2484	1.22 2385.64	2131.43	1741.61	1306.51	852.72	546.48	576.4	931.87	1476.32	2023.38	2481.36		(97)
Space he	ating requir	ement fo	r each m	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		ı	
(98)m= 1219	9.64 841.44	555.07	198.63	47.58	0	0	0	0	309.05	821.11	1271.31		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	5263.83	(98)
Space hea	ating requir	ement in	kWh/m²	² /year								48.24	(99)
9a. Energy	requireme	nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space he	_												_
Fraction o	f space hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction o	f space hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction o	f total heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency	of main spa	ace heat	ing syste	em 1							ĺ	206.29	(206)
Efficiency	of seconda	ry/suppl	ementar	y heating	g system	ո, %						0	(208)
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	_ ar
Space he	ating requir	ement (c	alculate	d above)									
1219	9.64 841.44	555.07	198.63	47.58	0	0	0	0	309.05	821.11	1271.31		
(211)m = {[(98)m x (20	04)] } x 1	00 ÷ (20	06)									(211)
	(/							_		000.04		I	
591	````	269.07	96.29	23.06	0	0	0	0	149.81	398.04	616.27		
591	````	269.07	96.29	23.06	0	0			149.81 ar) =Sum(2			2551.66	(211)
	````				0	0						2551.66	(211)
	.22 407.89 ating fuel (s	econdar	y), kWh/		0	0						2551.66	(211)
Space hea	22 407.89 ating fuel (s (201)] } x 1	econdar	y), kWh/		0	0	Tota	I (kWh/yea	ar) =Sum(2 0	0	= 0	2551.66	(211)
Space hea = {[(98)m x	22 407.89 ating fuel (s (201)] } x 1	econdar 00 ÷ (20	y), kWh/ 08)	month		<u>i</u>	Tota	I (kWh/yea	L ar) =Sum(2	0	= 0	2551.66	(211)

Water heating								
Output from water heater (calculated above) 193.84 170.37 177.79 157.8 153.5 1	135.52 128.59	143.25	143.67	163.71	175.08	188.64		
Efficiency of water heater						100101	100	(216)
(217)m= 100 100 100 100 100	100 100	100	100	100	100	100		(217)
Fuel for water heating, kWh/month	•							
(219) m = (64) m x $100 \div (217)$ m (219)m = 193.84 170.37 177.79 157.8 153.5 1	135.52 128.59	143.25	143.67	163.71	175.08	188.64		
(2.6)			I = Sum(2				1931.76	(219)
Annual totals				k\	Wh/year	•	kWh/year	┛` ′
Space heating fuel used, main system 1					•		2551.66	
Water heating fuel used							1931.76	1
Electricity for pumps, fans and electric keep-hot								_
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			0	(231)
Electricity for lighting							425.55	(232)
Electricity generated by PVs							-778.07	(233)
Electricity generated by PVs 12a. CO2 emissions – Individual heating system	ns including mi	cro-CHP					-778.07	(233)
	ns including mi Energy kWh/year	cro-CHP		Emiss kg CO	ion fac 2/kWh	tor	-778.07 Emissions kg CO2/yea	
	Energy	cro-CHP			2/kWh	tor =	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year	cro-CHP		kg CO	2/kWh		Emissions kg CO2/yea	ar
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year	cro-CHP		kg CO:	2/kWh	=	Emissions kg CO2/yea	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x			0.5°	2/kWh	=	Emissions kg CO2/yea 1324.31	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x			0.5°	2/kWh	=	Emissions kg CO2/yea 1324.31 0 1002.58	(261) (263) (264)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262)			0.5 0.5 0.5	2/kWh 19 19 19	= = =	Emissions kg CO2/yea 1324.31 0 1002.58 2326.89	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) x (231) x			0.5 0.5 0.5 0.5 0.5	2/kWh 19 19 19 19	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/yea 1324.31 0 1002.58 2326.89 0 220.86	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year (211) x (215) x (219) x (261) + (262) x (231) x		264) =	0.5 0.5 0.5	2/kWh 19 19 19 19	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/yea 1324.31 0 1002.58 2326.89	(261) (263) (264) (265) (267)

 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

19.65

81

		User Details:			
Assessor Name:	Su Lee	Stroma Num	iber: ST	RO031315	
Software Name:	Stroma FSAP 2012	Software Ve		rsion: 1.0.4.16	
	F	Property Address: Unit 05	5		
Address :	138-140 Highgate Road, Hi	ghgate, Highgate, NW5	1PB		
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m³)
Basement		41.06 (1a) x	2.7 (2a)	= 110.86	(3a)
Ground floor		35.9 (1b) x	3.2 (2b)	= 114.88	(3b)
First floor		32.25 (1c) x	4.65 (2c)	= 149.96	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 109.21 (4)			
Dwelling volume		(3a)+(3b	o)+(3c)+(3d)+(3e)+(3n)	375.7	(5)
2. Ventilation rate:					
	main seconda heating heating	ry other	total	m³ per hou	r
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ins		5 x 10 =	50	(7a)
Number of passive vents	3		0 x 10 =	0	(7b)
Number of flueless gas f	ires		0 x 40 =	0	(7c)
			Aiı	r changes per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	50 ÷ (5) =	0.13	(8)
If a pressurisation test has b	peen carried out or is intended, procee	ed to (17), otherwise continue fi	rom (9) to (16)		_
Number of storeys in t	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0.1	0	(10)
	2.25 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 greater wan area (alter			
If suspended wooden	floor, enter 0.2 (unsealed) or 0	.1 (sealed), 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 x (14) ÷ 1	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (11)	12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metre	es per hour per square m	netre of envelope area	4	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + (18)$	8), otherwise (18) = (16)		0.33	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a degree air permeability	is being used		
Number of sides sheltered	ed			2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	19)] =	0.85	(20)
Infiltration rate incorpora	ting shelter factor	$(21) = (18) \times (20) =$		0.28	(21)
Infiltration rate modified	for monthly wind speed				
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov D	ec	
Monthly average wind sp	peed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

(22)m=

5.1

5

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltra	ation rate	e (allowi	na for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	!				
0.36	0.35	0.35	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33		
Calculate effec		_	rate for t	he appli	cable ca	se	ļ	ļ	!	ļ			
If mechanica			l' N (0	OL) (00	/		15// (1	. (00)	\ (00 \			0	
If exhaust air he		•	,	, ,				,)) = (23a)		[0	
If balanced with		-	•	_					Ob.\	00h) [4	(22.5)	. 4001	(23c)
a) If balance	o mecha	o 0	nillation 0	with nea	at recove		1R) (248	$\frac{1}{1} = \frac{2}{1}$	2b)m + (. 0	23b) x [0 (23C)	÷ 100]	(24a)
b) If balance	_										Ů		(Σ ια)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h						/entilatio	n from c	L outside					, ,
if (22b)m				•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural													
if (22b)m			· `		<u> </u>								(5.4.1)
(24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(24d)
Effective air			<u> </u>	<u> </u>	``	``	. 	`		0.55	0.50		(05)
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
3. Heat losses	s and he	at loss p	oaramete	er:									
3. Heat losses	s and he Gros area	ss	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros	ss	Openin	gs						<) 			
ELEMENT	Gros area	ss	Openin	gs	A ,n	n² x	W/m2	=	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	ss	Openin	gs	A ,r	m ² x x x1/	W/m2	eK = 0.04] =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	ss	Openin	gs	A ,n 2.46 4.86	x 1/	W/m2 1.4 /[1/(1.4)+	0.04] = 0.04] =	(W/I 3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 2	ss	Openin	gs	A ,n 2.46 4.86 5.21	x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91	<)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 2 2 3 4 4	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4	x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.91 1.86	<) 			kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 3 4 4 5	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86	x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44	<)			kJ/K (26) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 6 6	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29	x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 5 6 6 7	ss	Openin	gs	A ,r 2.46 4.86 5.21 1.4 4.86 5.29 4.86	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 1 2 2 3 3 4 4 5 5 6 6 7 e 1	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 1 2 2 3 3 4 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 1 2 2 3 3 4 4 5 6 7 e 1 e 2	ss	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ	Gros area 1 1 2 2 3 3 4 4 5 6 7 e 1 e 2	es (m²)	Openin	gs	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Floor	Gros area 1 1 2 2 3 4 4 5 6 6 7 6 1 6 2 6 2 6 3	ss (m²)	Openin	gs ₁ ²	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3378				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 1 6 2 6 3	ss (m²)	Openin m	gs ₁ ²	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 4.718 1.582 1.372 5.3378 1.55				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1 Walls Type2	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 1 6 2 7 6 2 6 3 5.08	1 3 5	Openin m	gs ₁ 2	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06 10.31	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 6.44 7.01 4.718 1.582 1.372 5.3378 1.55 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ Floor Walls Type1 Walls Type2 Walls Type3	Gros area 11 22 33 44 55 66 7 61 62 63 10.3	1 3 1	0 4.86 1.4	gs ₁₂	A ,n 2.46 4.86 5.21 1.4 4.86 5.29 4.86 5.29 3.37 1.13 0.98 41.06 10.31 0.22 -0.05	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.91 1.86 6.44 7.01 4.718 1.582 1.372 5.3378 1.55 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Walls Type6 0.8 0	0.8 ×	0.15 =	0.12			(29)
Walls Type7 0.96 0	0.96 ×	0.15 =	0.14			(29)
Walls Type8 6.75 0	6.75 ×	0.15 =	1.01			(29)
Walls Type9 5 0	5 x	0.15 =	0.75			(29)
Walls Type10 5.76 4.86	0.9 ×	0.15 =	0.14			(29)
Walls Type11 0.42 0	0.42 ×	0.15	0.06			(29)
Walls Type12 6.4 0	6.4 ×	0.15 =	0.96			(29)
Walls Type13 9.11 5.29	3.82 ×	0.15 =	0.57			(29)
Walls Type14 1.86 0	1.86 ×	0.15 =	0.28			(29)
Walls Type15 8.6 2.46	6.14 ×	0.15 =	0.92			(29)
Walls Type16 9.3 0	9.3 ×	0.15 =	1.4			(29)
Walls Type17 0.6 0	0.6 ×	0.15 =	0.09		i	(29)
Walls Type18 8.37 4.86	3.51 ×	0.15 =	0.53			(29)
Roof Type1 31.76 4.5	27.26 ×	0.13 =	3.54		i	(30)
Roof Type2 3.34 0.98	2.36 ×	0.13 =	0.31		i	(30)
Total area of elements, m ²	168.31					(31)
Party wall	30.19 ×	0 =	0		7	(32)
Party wall	27.95 ×	0 =	0		ī	(32)
Party wall	33.7 ×	0 =	0		ī	(32)
Party wall	33.09 ×	0 =	0		ī	(32)
Party wall	38.73 ×	0 =	0		i	(32)
Party wall	40 x	0 =	0		i	(32)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa		ng formula 1/[(1/U-va	lue)+0.04] as given i	n paragraph :	3.2	_
Fabric heat loss, W/K = S (A x U)	aration o	(26)(30) + (32) =	:	Г	70.7	(33)
Heat capacity Cm = S(A x k)		((28)	(30) + (32) + (32a))(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	Indic	ative Value: Medium	, F	250	(35)
For design assessments where the details of the constru	ction are not known p	precisely the indicativ	ve values of TMP in	Table 1f		
can be used instead of a detailed calculation.	nn andiv V			г		7(00)
Thermal bridges : S (L x Y) calculated using A if details of thermal bridging are not known (36) = 0.15×10^{-2}	• •			L	15.95	(36)
Total fabric heat loss	101)	(33)	+ (36) =	Γ	86.65	(37)
Ventilation heat loss calculated monthly		(38)r	$m = 0.33 \times (25) m \times (8)$	5)		
Jan Feb Mar Apr May	Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 70.07 69.76 69.45 68 67.73	66.48 66.48	66.24 66.96	67.73 68.28	68.85		(38)
Heat transfer coefficient, W/K		(39)r	m = (37) + (38)m			
(39)m= 156.72 156.41 156.1 154.66 154.39	153.13 153.13	152.9 153.61	154.39 154.93	155.5		_
Heat loss parameter (HLP), W/m²K		(40)r	Average = Sum(39) $m = (39)m \div (4)$	112 /12=	154.66	(39)
(40)m= 1.44 1.43 1.43 1.42 1.41	1.4 1.4	1.4 1.41	1.41 1.42	1.42		
	1 1	1 1	Average = Sum(40)	-	1.42	(40)
Number of days in month (Table 1a)	ادا میرا ر	Aug Co-	Oct New			
Jan Feb Mar Apr May	/ Jun Jul	Aug Sep	Oct Nov	Dec		

(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•	•					•						
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ if TFA > 13 if TFA £ 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		81		(42)
Annual avera Reduce the annu	ge hot wa gelal average	hot water	usage by	5% if the a	lwelling is	designed			se target of		0.94		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)				-		
(44)m= 111.03	106.99	102.96	98.92	94.88	90.84	90.84	94.88	98.92	102.96	106.99	111.03		1
Energy content of	of hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	т х пт х <u>Г</u>	OTm / 3600		Total = Sur oth (see Ta			1211.25	(44)
(45)m= 164.66	144.01	148.6	129.56	124.31	107.27	99.4	114.07	115.43	134.52	146.84	159.46		
If instantaneous	water heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Γotal = Sur	m(45) ₁₁₂ =		1588.14	(45)
(46)m= 24.7	21.6	22.29	19.43	18.65	16.09	14.91	17.11	17.31	20.18	22.03	23.92		(46)
Water storage		\ : alal:-a		-1	/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	-1			1				
Storage volur	•	,	•			_		ame ves	sei		210		(47)
If community Otherwise if r	•			_			` '	ers) ente	er 'O' in <i>(4</i>	47)			
Water storage			. (0.0, 0		,			
a) If manufac	turer's d	eclared l	oss fact	or is kno	wn (kWh	n/day):				1.	57		(48)
Temperature	factor fro	m Table	2b							0	.6		(49)
Energy lost fr b) If manufac		•			or ic not		(48) x (49)) =		0.	94		(50)
Hot water sto			,								0		(51)
If community	•		on 4.3										
Volume facto			01								0		(52)
Temperature											0		(53)
Energy lost fr		•	, kWh/y	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Enter (50) or Water storage	. , .	•	for oach	month			((56)m - ((55) × (41)	m	0.	94		(55)
					20.26		1		-	20.26	20.2		(56)
(56)m= 29.2 If cylinder contain	26.38	29.2 ed solar sto	28.26 rage, (57)	29.2 m = (56)m	28.26 x [(50) – (29.2 H11)] ÷ (5	29.2 0), else (5	28.26 7)m = (56)	29.2 m where (I	28.26 H11) is fro	29.2 m Append	ix H	(30)
(57)m= 29.2	26.38	29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2		(57)
Primary circu	it loss (ar	nnual) fro	ı——— om Table	- 3	Į.	Į.	ļ.	ļ			0		(58)
Primary circu	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat red	quired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.86	170.39	177.81	157.82	153.52	135.53	128.61	143.27	143.69	163.72	175.1	188.66		(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 193.86 170.39 177.81 157.82 153.52 135.53 128.61 143.27 143.69 163.72 175.1 188.66	
Output from water heater (annual) ₁₁₂ 1	1931.97 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]	
(65)m= 78.11 68.98 72.77 65.69 64.7 58.28 56.41 61.29 60.99 68.09 71.43 76.38	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	ng
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 140.5 140.5 140.5 140.5 140.5 140.5 140.5 140.5 140.5 140.5 140.5 140.5 140.5	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 24.11 21.41 17.41 13.18 9.85 8.32 8.99 11.69 15.68 19.91 23.24 24.78	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 270.42 273.22 266.15 251.1 232.09 214.23 202.3 199.5 206.57 221.62 240.62 258.48	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05 37.05	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4 -112.4	(71)
Water heating gains (Table 5)	
(72)m= 104.99 102.65 97.81 91.23 86.96 80.94 75.82 82.38 84.71 91.52 99.21 102.66	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 464.66 462.44 446.53 420.66 394.06 368.64 352.27 358.71 372.11 398.21 428.23 451.08	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
~	ains
	(W)
	22.01 (75)
Northeast 0.9x 0.77 x 5.29 x 11.28 x 0.76 x 0.7 =	22.01 (75)
Northeast 0.9x 0.77 x 5.29 x 22.97 x 0.76 x 0.7 =	44.79 (75)
Northeast 0.9x 0.77 x 5.29 x 22.97 x 0.76 x 0.7 =	44.79 (75)
Northeast 0.9x 0.77 x 5.29 x 41.38 x 0.76 x 0.7 =	80.7 (75)
Northeast 0.9x 0.77 x 5.29 x 41.38 x 0.76 x 0.7 =	80.7 (75)
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 =	132.53 (75)
Northeast 0.9x 0.77 x 5.29 x 67.96 x 0.76 x 0.7 =	132.53 (75)
Northeast 0.9x 0.77 x 5.29 x 91.35 x 0.76 x 0.7 =	178.15 (75)
Northeast 0.9x 0.77 x 5.29 x 91.35 x 0.76 x 0.7 =	178.15 (75)

Northeast _{0.9x}	0.77] x	5.29	1 x	97.38	1 x	0.76	X	0.7	1 =	189.93	(75)
Northeast 0.9x	0.77	」^] ×	5.29] ^] x	97.38] ^] x	0.76	X	0.7] -] =	189.93	(75)
Northeast 0.9x	0.77	」^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7] -] =	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	91.1] ^] x	0.76	X	0.7]	177.67	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	X	0.7]	141.64	(75)
Northeast 0.9x	0.77	」 ^] x	5.29] ^] x	72.63] ^] x	0.76	x	0.7]	141.64	(75)
Northeast 0.9x	0.77]	5.29] ^] x	50.42] ^] x	0.76	x	0.7] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	50.42]	0.76	X	0.7]] =	98.34	(75)
Northeast _{0.9x}	0.77]	5.29] ^] x	28.07] ^] x	0.76	x	0.7] =	54.74	(75)
Northeast 0.9x	0.77]	5.29] ^] x	28.07]	0.76	x	0.7]] =	54.74	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77] x	5.29) x	14.2] x	0.76	x	0.7]] =	27.69	(75)
Northeast _{0.9x}	0.77]]	5.29]]	9.21]]	0.76	X	0.7]] =	17.97	(75)
Northeast _{0.9x}	0.77]]	5.29]] x	9.21]]	0.76	X	0.7]] =	17.97	(75)
Southwest _{0.9x}	0.77]]	4.86	l l x	36.79]]	0.76	X	0.7]] =	65.93	(79)
Southwest _{0.9x}	0.77] X	5.21	ı I x	36.79]]	0.76	X	0.7]] =	70.67	(79)
Southwest _{0.9x}	0.77	X	4.86) x	36.79	1	0.76	x	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86] x	36.79]	0.76	X	0.7] =	65.93	(79)
Southwest _{0.9x}	0.77	X	4.86) x	62.67]	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	5.21	X	62.67	i	0.76	x	0.7	j =	120.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	<u>.</u>	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	62.67	ĺ	0.76	х	0.7	=	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	X	5.21	x	85.75	ĺ	0.76	x	0.7	j =	164.71	(79)
Southwest _{0.9x}	0.77	x	4.86	х	85.75	j	0.76	x	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	x	0.7	=	153.65	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	ĺ	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	x	5.21	x	106.25]	0.76	x	0.7] =	204.09	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25]	0.76	x	0.7	=	190.38	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	5.21	x	119.01]	0.76	x	0.7	=	228.6	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	x	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.21	x	118.15]	0.76	x	0.7	=	226.94	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.21	x	113.91		0.76	x	0.7] =	218.8	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)

Southwest _{0.9x}		1		1		1		١		1		7(70)
Southwest _{0.9x}	0.77	X	4.86	X	113.91] 1	0.76	X	0.7] = 1	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	5.21	X	104.39] 1	0.76	X	0.7] = 1	200.51	(79)
Southwesto.9x	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39]	0.76	X	0.7] =	187.04	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	5.21	X	92.85]	0.76	X	0.7] =	178.35	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	5.21	X	69.27	ļ	0.76	X	0.7	=	133.05	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.21	X	44.07		0.76	X	0.7	=	84.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	44.07]	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.21	X	31.49]	0.76	X	0.7	=	60.48	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	x	11.28	x	0.76	x	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	x	22.97	x	0.76	x	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	x	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	x	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	x	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	x	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest 0.9x	0.77	X	1.4	x	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	x	28.07	x	0.76	x	0.7	=	14.49	(81)
Northwest _{0.9x}	0.77	X	1.4	x	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest 0.9x	0.77	X	1.4	x	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	x	26	x	0.76	x	0.7	<u> </u>	41.95	(82)
Rooflights _{0.9x}	1	X	1.13	x	26	x	0.76	x	0.7] =	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	×	26	x	0.76	x	0.7] =	12.2	(82)
Rooflights _{0.9x}	1	x	3.37	x	54	x	0.76	x	0.7] =	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	=	29.22	(82)
Rooflights _{0.9x}	1	j×	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights _{0.9x}	1	X	3.37	x	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	X	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
_		•		•		•		•		•		_

Rooflights 0.9x		— , "	0.00	一、	. —	00	1 ,	0.70	–	0.7		45.05	(02)
Rooflights 0.9x	1	X	0.98	×		96] X	0.76	X	0.7	=	45.05	(82)
	1	×	3.37	×		150	X	0.76	X	0.7	_ =	242.03	(82)
Rooflights 0.9x	1	×	1.13	→ ×		150] X]	0.76	×	0.7	=	81.16	(82)
Rooflights 0.9x	1	×	0.98	_ ×	_	150	X	0.76	X	0.7	=	70.38	(82)
Rooflights 0.9x	1	X	3.37	×	(192	X	0.76	X	0.7	=	309.8	(82)
Rooflights 0.9x	1	X	1.13	×	٠	192	X	0.76	X	0.7	=	103.88	(82)
Rooflights 0.9x	1	X	0.98	x		192	X	0.76	X	0.7	=	90.09	(82)
Rooflights _{0.9x}	1	X	3.37	x	()	200	X	0.76	X	0.7	=	322.71	(82)
Rooflights _{0.9x}	1	X	1.13	X	()	200	X	0.76	X	0.7	=	108.21	(82)
Rooflights 0.9x	1	X	0.98	×	(200	X	0.76	X	0.7	=	93.84	(82)
Rooflights _{0.9x}	1	X	3.37	X		189	X	0.76	X	0.7	=	304.96	(82)
Rooflights _{0.9x}	1	X	1.13	X		189	x	0.76	X	0.7	=	102.26	(82)
Rooflights 0.9x	1	X	0.98	×	(189	x	0.76	x	0.7	=	88.68	(82)
Rooflights 0.9x	1	x	3.37	= x	(157	x	0.76	x	0.7	_ =	253.33	(82)
Rooflights 0.9x	1	x	1.13	= ×	,	157	x	0.76	x	0.7	=	84.94	(82)
Rooflights _{0.9x}	1	x	0.98	= ×	,	157	jx	0.76	×	0.7	_ =	73.67	(82)
Rooflights 0.9x	1	x	3.37	x	,	115	X	0.76	x	0.7		185.56	(82)
Rooflights 0.9x	1	x	1.13	۲	,	115	X	0.76	x	0.7	=	62.22	(82)
Rooflights 0.9x	1	x	0.98			115]]	0.76	X	0.7	= =	53.96	(82)
Rooflights 0.9x	1	×	3.37	→ x	-	66]]	0.76	X	0.7	= =	106.49	(82)
Rooflights 0.9x	1	x	1.13	x		66] x	0.76	×	0.7		35.71	(82)
Rooflights 0.9x	<u>'</u> 1	×	0.98			66]	0.76	×	0.7		30.97	(82)
Rooflights 0.9x				\dashv $\stackrel{\wedge}{_{x}}$			」^] x		- ^				(82)
Rooflights 0.9x	1		3.37	=		33	1	0.76	- ^	0.7	=	53.25	(82)
Rooflights 0.9x	1	=	1.13	×		33] X] .,	0.76	≓ ¦	0.7	_ =	17.85	= `
Rooflights 0.9x	1	X	0.98	×	-	33] X]	0.76	X	0.7	_ =	15.48	(82)
Rooflights 0.9x	1	×	3.37	×		21] X]	0.76	X	0.7	=	33.88	(82)
· <u>L</u>	1	X	1.13	→ ×		21	X]	0.76	×	0.7	=	11.36	(82)
Rooflights _{0.9x}	1	X	0.98	X		21	X	0.76	X	0.7	=	9.85	(82)
0.1	-11		Cara a sala sa	. (1.			(00)	0 (74)	(00)				
Solar gains in (83)m= 386.5			1468.94 1775		1816 92	1729 37		1 = Sum(74)m. 1.36 1201.89	(82)m 802.52	470.83	325.54	1	(83)
Total gains – ir							140-	7.30 1201.03	002.02	470.00	020.04		(55)
			` 	· •	<u> </u>	2081.63	1853	3.07 1574	1200.7	3 899.06	776.61	1	(84)
` /							1	1 1 1 1 1					
7. Mean inter		,				T	- I - O	Th4 (00)					7(05)
Temperature	•	٠.			_		oie 9	, Int (°C)				21	(85)
Utilisation fac				-	`					T NI.		1	
Jan	Feb	Mar	'	lay	Jun	Jul	 	ug Sep	Oct	+	Dec		(06)
(86)m= 0.99	0.98	0.93	0.81 0.6	52	0.44	0.32	0.3	0.63	0.91	0.99	1		(86)
Mean internal	temperat			1 (fol		os 3 to 7	7 in T	able 9c)	ı			1	
(87)m= 21	21	21	21 2	1	21	21	2	1 21	21	21	21		(87)
Temperature	during he	ating pe	eriods in res	t of d	lwelling	from Ta	able 9	9, Th2 (°C)				_	
(88)m= 19.74	19.74	19.74	19.75 19.	75	19.76	19.76	19.	76 19.76	19.75	19.75	19.75]	(88)
			•					-		-		-	

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.91 0.76 0.55 0.36 0.23 0.28 0.53 0.87 0.98 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.74 19.74 19.74 19.75 19.75 19.75 19.76 19.76 19.76 19.76 19.75 19.75 19.75 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 20.15 20.15 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.15 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.15 20.15 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.17 20.16 20.16 20.16 20.15 (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
(90)m= 19.74 19.74 19.74 19.75 19.75 19.76 19.76 19.76 19.76 19.75 19.75 19.75 19.75 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2
(90)m= 19.74 19.74 19.74 19.75 19.75 19.76 19.76 19.76 19.76 19.75 19.75 19.75 19.75 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 20.15 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.16 20.15 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.15 20.15 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.16 20.15 (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
(92)m= 20.15 20.15 20.15 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.15 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.15 20.15 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.16 20.15 (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
(92)m= 20.15 20.15 20.15 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.15 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.15 20.15 20.15 20.16 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.16 20.15 (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
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.15 20.15 20.15 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.15 (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
(93)m= 20.15 20.15 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.16 20.15 (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
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm:
(94)m= 0.99 0.97 0.92 0.78 0.57 0.39 0.26 0.31 0.56 0.88 0.98 1 (94)
Useful gains, hmGm , $W = (94)m \times (84)m$
(95)m= 845.09 1133.67 1385.53 1465.72 1242.27 843.11 544.68 573.28 888.7 1061 883.1 772.78 (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 , $W = [(39) \text{m x} [(93) \text{m} - (96) \text{m}]]$
(97)m= 2483.79 2385.2 2130.98 1741.14 1306.02 852.21 545.96 575.87 931.36 1475.84 2022.93 2480.94 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 1219.2 841.03 554.62 198.3 47.43 0 0 0 0 308.64 820.68 1270.87
Total per year (kWh/year) = $Sum(98)_{15912}$ = 5260.76 (98)
Space heating requirement in kWh/m²/year 48.17 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (201)
Fraction of space heat from main system(s) $ (202) = 1 - (201) = $
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1 206.3 (206)
Efficiency of secondary/supplementary heating system, %
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)
1219.2 841.03 554.62 198.3 47.43 0 0 0 0 308.64 820.68 1270.87
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211)
590.99 407.68 268.84 96.13 22.99 0 0 0 149.61 397.81 616.04
Total (kWh/year) = Sum(211) _{15,1012} = 2550.09 (211)
Space heating fuel (secondary), kWh/month
$= \{[(98)m \times (201)]\} \times 100 \div (208)$
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0
Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)

Water heating								
Output from water heater (calculated above) 193.86 170.39 177.81 157.82 153.52 1	35.53 128.61	143.27	143.69	163.72	175.1	188.66		
Efficiency of water heater							100	(216)
(217)m= 100 100 100 100 100	100 100	100	100	100	100	100		(217)
Fuel for water heating, kWh/month	•						•	
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 193.86 170.39 177.81 157.82 153.52 1	35.53 128.61	143.27	143.69	163.72	175.1	188.66		
		Tota	I = Sum(2	19a) ₁₁₂ =			1931.97	(219)
Annual totals				k۱	Nh/year	•	kWh/year	-
Space heating fuel used, main system 1							2550.09	
Water heating fuel used							1931.97	
Electricity for pumps, fans and electric keep-hot								
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			0	(231)
Electricity for lighting							425.75	(232)
Electricity generated by PVs							-778.07	(233)
Electricity generated by PVs 12a. CO2 emissions – Individual heating system	ns including mi	cro-CHP					-778.07	(233)
	es including mi Energy kWh/year	cro-CHP		Emiss kg CO2	ion fac 2/kWh	tor	-778.07 Emissions kg CO2/yea	
	Energy	cro-CHP			2/kWh	tor =	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year	cro-CHP		kg CO2	2/kWh		Emissions kg CO2/yea	ar
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year	cro-CHP		kg CO2	2/kWh	=	Emissions kg CO2/yea	ar [261]
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x			0.5°	2/kWh	=	Emissions kg CO2/yea 1323.49	(261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x			0.5°	2/kWh	=	Emissions kg CO2/yea 1323.49 0 1002.69	(261) (263) (264)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262)			0.5°	2/kWh	= = =	Emissions kg CO2/yea 1323.49 0 1002.69 2326.19	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x			0.5° 0.5° 0.5°	2/kWh	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/yea 1323.49 0 1002.69 2326.19	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x			0.5° 0.5° 0.5°	2/kWh	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/yea 1323.49 0 1002.69 2326.19	(261) (263) (264) (265) (267)

 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

19.63

81

		User Details:			
Assessor Name: Software Name:	Su Lee Stroma FSAP 2012	Stroma Nun Software Ve		O031315 ion: 1.0.4.16	
Adduses		roperty Address: Unit 0			
Address: 1. Overall dwelling dime	138-140 Highgate Road, Hig	gngate, Highgate, NVV5	TPB		
1. Overall dwelling dime	511310113.	Area(m²)	Av. Height(m)	Volume(m	3)
Basement		38.62 (1a) x	2.7 (2a) =		(3a)
Ground floor		34.58 (1b) x	3.2 (2b) =	110.66	(3b)
First floor		31.61 (1c) x	4.65 (2c) =	146.99	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1r	1) 104.81 (4)			
Dwelling volume		(3a)+(3	b)+(3c)+(3d)+(3e)+(3n) =	361.92	(5)
2. Ventilation rate:					
	main secondar heating heating	y other	total	m³ per hoι	ır
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ns		5 x 10 =	50	(7a)
Number of passive vents	3		0 x 10 =	0	(7b)
Number of flueless gas f	ires	[0 x 40 =	0	(7c)
			Air	changes per he	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7	(a)+(7b)+(7c) =	50 ÷ (5) =	0.14	(8)
	peen carried out or is intended, proceed	d to (17), otherwise continue			
Number of storeys in t	he dwelling (ns)			0	(9)
Additional infiltration			[(9)-1]x0.1 =	0	(10)
	2.25 for steel or timber frame or resent, use the value corresponding to	•	truction	0	(11)
= -	floor, enter 0.2 (unsealed) or 0.	1 (sealed), else enter 0		0	(12)
If no draught lobby, en	,	, ,,		0	(13)
•	s and doors draught stripped			0	(14)
Window infiltration	5	0.25 - [0.2 x (14) ÷	100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + ((12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed in cubic metre	s per hour per square n	netre of envelope area	4	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + (8)$	3), otherwise (18) = (16)		0.34	(18)
Air permeability value applie	es if a pressurisation test has been don	e or a degree air permeability	is being used		
Number of sides sheltered	ed			1	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($	(19)] =	0.92	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18) x (20) =		0.31	(21)
Infiltration rate modified t	for monthly wind speed			_	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec	;	
Monthly average wind sp	peed from Table 7				

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	2a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
									<u>!</u>				
Adjusted infiltra		· · · · · ·				. 	`	`´	I 0.04	0.05	0.07		
0.4 Calculate effec	0.39 ctive air	0.38 change	0.34 rate for t	0.34 he appli	0.3 cable ca	0.3 SE	0.29	0.31	0.34	0.35	0.37		
If mechanica		-		upp	- C.I.O. T. G. G.							0	(23a)
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1	l – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	d mecha	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		ı	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho				•	-								
if (22b)m		<u> </u>	· `	``	<u> </u>	· ` `	ŕ		· ` ·	i e		ı	(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(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		(24d)
Effective air						<u> </u>	<u> </u>						
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
			•				•					l	
3 Heat Insses	s and he	at loss i	naramete	or.									
3. Heat losses	s and he Gros				Net Ar	ea	U-valı	ue	AXU		k-value	<u>.</u>	AXk
3. Heat losses		SS	paramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
	Gros	SS	Openin	gs		n²				<)			
ELEMENT	Gros area	SS	Openin	gs	A ,r	m² x	W/m2	2K =	(W/I	<) 			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,r	m ² x x x 1/2	W/m2	eK = 0.04] =	(W/I	<) 			kJ/K (26)
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,r 2.46 4.86	m ² x x1/2 x1/2	W/m2 1.4 /[1/(1.4)+	eK = 0.04] = 0.04] =	(W/I 3.444 6.44	<) 			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.46 4.86 5.01	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.64	<) 			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3 4	SS	Openin	gs	A ,r 2.46 4.86 5.01	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.64 1.86	<) 			kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.444 6.44 6.64 1.86 6.44	<)			kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area 1 2 3 4 5	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.64 1.86 6.44 6.75	<)			kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 e 1	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 4.718	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2	SS	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	W/m2 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	5 (m²)	Openin m	gs ₁ ²	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62 10.15	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206 1.52 4.01				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2 Walls Type3	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	55 (m²)	Openin m	gs ₁ ²	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62 10.15 26.7 0.22	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 1.4 /[1/(1.4)+ /[1/(1.	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206 1.52 4.01 0.03				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Rooflights Type Walls Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 e 1 e 2 e 3	55 (m²)	Openin m	gs ₁₂	A ,r 2.46 4.86 5.01 1.4 4.86 5.09 4.86 5.09 3.37 1.13 0.98 38.62 10.15	m ²	W/m2 1.4 /[1/(1.4)+ /[1/(1	K	(W/I 3.444 6.44 6.64 1.86 6.44 6.75 6.44 6.75 4.718 1.582 1.372 5.0206 1.52 4.01				kJ/K (26) (27) (27) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29)

Walls Type6	6.0	2	5.09		0.93	X	0.15	=	0.14				(29)
Walls Type7	0.0	3	0		0.8	X	0.15	=	0.12				(29)
Walls Type8	0.9	6	0		0.96	X	0.15	=	0.14				(29)
Walls Type9	5.2	8	0		5.28	X	0.15	=	0.79				(29)
Walls Type10	5		0		5	X	0.15	<u> </u>	0.75				(29)
Walls Type11	5.7	6	4.86		0.9	X	0.15	<u> </u>	0.14				(29)
Walls Type12	0.4	2	0		0.42	X	0.15	<u> </u>	0.06				(29)
Walls Type13	6.1	8	0		6.18	X	0.15	<u> </u>	0.93				(29)
Walls Type14	8.7	4	5.09		3.65	X	0.15	=	0.55				(29)
Walls Type15	1.8	6	0		1.86	X	0.15	=	0.28				(29)
Walls Type16	8.6	3	2.46	i .	6.14	X	0.15	=	0.92				(29)
Walls Type17	40)	0		40	X	0.15	=	6				(29)
Walls Type18	8.9	7	0		8.97	X	0.15	=	1.35				(29)
Walls Type19	0.6	3	0		0.6	X	0.15	=	0.09				(29)
Walls Type20	8.3	7	4.86		3.51	X	0.15	=	0.53				(29)
Roof Type1	31.1	14	4.5		26.64	X	0.13		3.46				(30)
Roof Type2	2.3	8	0.98		1.4	X	0.13		0.18				(30)
Total area of	elements	s, m²			229.3	8							(31)
Party wall					29.19) X	0		0				(32)
Party wall					32.58	X	0	=	0				(32)
Party wall					38.73	x	0	=	0				(32)
* for windows and ** include the are						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
Fabric heat lo				is and pan	uuons		(26)(30)	+ (32) =				79.24	(33)
Heat capacity	•	`	•,				. , . ,	((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass		` '	c = Cm -	- TFA) ir	n kJ/m²K				tive Value	, , ,	, ,	250	(35)
For design asses	•	•		•			ecisely the	indicative	values of	TMP in Ta	able 1f		(```
can be used inste						_							_
Thermal bridg	•	,		• •	•	<						15.38	(36)
if details of therm Total fabric he		are not kn	iOWII (30) =	= U. 15 X (3	1)			(33) +	(36) =			94.62	(37)
Ventilation he	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 69.21	68.85	68.48	66.79	66.47	64.99	64.99	64.72	65.56	66.47	67.11	67.78		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 163.83	163.46	163.1	161.4	161.08	159.6	159.6	159.33	160.17	161.08	161.73	162.4		
Heat lose per	omotor (l	-II D) \ \\	/m21/						Average =		12 /12=	161.4	(39)
Heat loss para (40)m= 1.56	1.56	1.56	1.54	1.54	1.52	1.52	1.52	1.53	= (39)m ÷	1.54	1.55		
(.0)	1	L	I	1.04	I	L	I		Average =		L	1.54	(40)
Number of da	ys in mo	nth (Tab	le 1a)									1	_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Water heating	enerav reau	uirement:								kWh/ye	ar:	
Assumed occupar if TFA > 13.9, N if TFA £ 13.9, N	= 1 + 1.76	х [1 - ехр	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		.78		(42)
Annual average h Reduce the annual av not more that 125 litre	erage hot wate	r usage by	5% if the c	lwelling is	designed			se target o		0.22		(43)
	<u> </u>	· ·	1	1	· ·	Λα	Con	Oct	Nov	Dool		
Jan I Hot water usage in litro	eb Mar	Apr each month	May $Vd,m = fa$	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	6.23 102.23	98.22	94.21	90.2	90.2	94.21	98.22	102.23	106.23	110.24		
Energy content of hot	water used - ca	olculated m	onthly – 1	100 v Vd i	m v nm v l	Tm / 3600		Total = Su	. ,	L	1202.65	(44)
	2.99 147.55	128.64	123.43	106.51	98.7	113.26	114.61	133.57	145.8	158.33		
(10)	1	1.20.0	120.10	100.01	1 00	1		Total = Su		1	1576.86	(45)
If instantaneous water	heating at poin	t of use (no	hot water	r storage),	enter 0 in	boxes (46			(-72	L		_ `
(46)m= 24.52 2° Water storage los	.45 22.13	19.3	18.51	15.98	14.8	16.99	17.19	20.04	21.87	23.75		(46)
Storage volume (I		ng any s	olar or W	WHRS	storage	within sa	ame ves	sel		210		(47)
If community heat	ng and no t	ank in dv	/elling, e	nter 110) litres in	(47)						
Otherwise if no ste	red hot wat	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage los		l ()		- /1.14/1	l. 1.1 \							
a) If manufacture			or is kno	wn (kvvi	n/day):					.57		(48)
Temperature factor						(40)				0.6		(49)
Energy lost from v b) If manufacture	_	-		or is not		(48) x (49)) =		0.	.94		(50)
Hot water storage		-								0		(51)
If community heat	•	ion 4.3										
Volume factor from		. 2h							-	0		(52)
Temperature factor						·	. (==) (\		0		(53)
Energy lost from v	_	e, kWh/y	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Enter (50) or (54)	` '	for oooh	manth			//EC\m /	FF\ (44)		0.	.94		(55)
Water storage los	<u> </u>	т		1		((56)m = (·					(50)
(56)m= 29.2 26 If cylinder contains dec	.38 29.2	28.26	29.2 m = (56)m	28.26	29.2	29.2	28.26	29.2	28.26	29.2	√ ⊔	(56)
	.38 29.2	28.26	29.2	28.26	29.2	29.2	28.26	29.2	28.26	29.2	X 11	(57)
` ′			l	20.20	29.2	29.2	20.20	29.2	<u> </u>			, ,
Primary circuit los	` ,			(50)	(50) 0(NE (44)				0		(58)
Primary circuit los (modified by fac			,		. ,	, ,		r thermo	etat)			
(59)m= 0	0 0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcul	ted for each	n month	(61)m =	(60) ÷ 30	65 × (41)m	<u>l</u>	!	<u>l</u>	<u> </u>		
(61)m= 0	0	0	0 0	00) . 0	0	0	0	0	0	0		(61)
Total heat require	<u> </u>	ļ									(59)m + (61)m	
	9.36 176.75	156.9	152.63	134.77	127.9	142.46	142.87	162.77	174.06	187.53	(00)111 1 (01)11	(62)
Solar DHW input calcu		ı	<u> </u>		l		<u> </u>		l			` '
(add additional lin												
(63)m= 0	0 0	0	0	0	0	0	0	0	0	0		(63)
		1	<u> </u>	<u> </u>	ı	<u> </u>	<u> </u>	I	<u> </u>			

Output from water hea	ater											
(64)m= 192.69 169.36	176.75	156.9	152.63	134.	77 127.9	142	.46 142.87	162.7	7 174.06	187.53		
<u> </u>					!	<u>. </u>	Output from w	ater hea	ter (annual)₁	12	1920.69	(64)
Heat gains from water	heating,	kWh/m	onth 0.2	5 ′ [0	.85 × (45)m	n + (6	61)m] + 0.8 x	x [(46)r	m + (57)m	+ (59)m	1	_
(65)m= 77.72 68.64	72.42	65.38	64.4	58.0	02 56.18	61.	02 60.72	67.77	71.09	76.01	_	(65)
include (57)m in cal	culation o	of (65)m	only if c	ylind	er is in the	dwel	ling or hot w	ater is	from com	munity h	i leating	
5. Internal gains (se	e Table 5	and 5a):	-								
Metabolic gains (Table	e 5), Wat	ts										
Jan Feb	Mar	Apr	May	Jι	ın Jul	А	ug Sep	Oct	Nov	Dec		
(66)m= 138.99 138.99	138.99	138.99	138.99	138.	99 138.99	138	138.99	138.9	138.99	138.99		(66)
Lighting gains (calcula	ated in Ap	pendix	L, equat	ion L	9 or L9a), a	also s	see Table 5					
(67)m= 23.52 20.89	16.99	12.86	9.62	8.1	2 8.77	11	.4 15.3	19.43	22.68	24.18		(67)
Appliances gains (calc	culated in	Append	dix L, eq	uatio	n L13 or L1	3a),	also see Ta	ble 5				
(68)m= 263.88 266.62	259.72	245.03	226.48	209.	05 197.41	194	.67 201.57	216.20	6 234.81	252.23		(68)
Cooking gains (calcula	ated in Ap	pendix	L, equa	tion L	.15 or L15a), als	o see Table	5	-		•	
(69)m= 36.9 36.9	36.9	36.9	36.9	36.	9 36.9	36	.9 36.9	36.9	36.9	36.9		(69)
Pumps and fans gains	(Table 5	 ба)					•		-	•	•	
(70)m= 0 0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. evaporation	on (negat	ive valu	es) (Tab	ole 5)	•		•	•	•	•	•	
(71)m= -111.19 -111.19	-111.19	-111.19	-111.19	-111	19 -111.19	-111	.19 -111.19	-111.1	9 -111.19	-111.19		(71)
Water heating gains (Table 5)				•		•	•	•	•		
(72)m= 104.46 102.15	97.34	90.81	86.56	80.9	59 75.51	82.	02 84.33	91.09	98.73	102.16		(72)
Total internal gains :	· =				(66)m + (67)n	n + (68	8)m + (69)m +	(70)m +	(71)m + (72))m		
(73)m= 456.56 454.36	438.75	413.39	387.36	362.	46 346.39	352	2.79 365.9	391.4	9 420.92	443.27		(73)
6. Solar gains:					,		,	•	,			
Solar gains are calculated	using solar	r flux from	Table 6a	and as	sociated equa	ations	to convert to th	ne applic	able orientat	tion.		
Orientation: Access		Area			Flux		g_ Table 01		FF		Gains	
Table 60	1 	m²			Table 6a	_	Table 6b		Table 6c		(W)	
Northeast 0.9x 0.77	x	5.0	9	x	11.28	X	0.76	X	0.7	=	21.17	(75)
Northeast 0.9x 0.77	×	5.0	9	X	11.28	X	0.76	X	0.7	=	21.17	(75)
Northeast _{0.9x} 0.77	×	5.0	9	X	22.97	X	0.76	X	0.7	=	43.1	(75)
Northeast 0.9x 0.77	×	5.0	9	X	22.97	X	0.76	X	0.7	=	43.1	(75)
Northeast 0.9x 0.77	×	5.0	9	x	41.38	X	0.76	X	0.7	=	77.65	(75)
Northeast 0.9x 0.77	×	5.0	9	x	41.38	X	0.76	X	0.7	=	77.65	(75)
Northeast 0.9x 0.77	×	5.0	9	x	67.96	X	0.76	X	0.7	=	127.52	(75)
Northeast 0.9x 0.77	X	5.0	9	x	67.96	X	0.76	x	0.7	=	127.52	(75)
Northeast 0.9x 0.77	X	5.0	9	x	91.35	X	0.76	x	0.7	=	171.42	(75)
Northeast 0.9x 0.77	×	5.0	9	x	91.35	X	0.76	X	0.7	=	171.42	(75)
Northeast 0.9x 0.77	X	5.0	9	x	97.38	X	0.76	x	0.7	=	182.75	(75)
North cost of						7						7(75)

0.77

5.09

97.38

0.76

0.7

Northeast 0.9x

182.75

(75)

Northeast _{0.9x}	0.77) x	F 00	l x	01.1] _x	0.76	X	0.7	1 =	170.06	(75)
Northeast 0.9x	0.77	J 1	5.09]]	91.1]]	0.76	! !] 1	170.96	(75)
Northeast 0.9x	0.77] x] ,	5.09	l x l v	91.1	X	0.76	X	0.7] = 1 _	170.96	(75)
Northeast 0.9x	0.77] x] x	5.09	x x	72.63] x] x	0.76	X	0.7] =] =	136.29	(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] _x	72.63 50.42] ^] x	0.76	^ x	0.7]	136.29 94.62	(75)
Northeast 0.9x] ^] x] ^] x] ^] x		^ x]		(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] x	28.07] ^] x	0.76	^ x	0.7]	94.62 52.67	(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] x	28.07] ^] _x	0.76	x	0.7]	52.67	(75)
Northeast 0.9x	0.77] ^] x	5.09] ^] _x	14.2] ^] x	0.76	^ x	0.7] -] =	26.64	(75)
Northeast 0.9x	0.77]	5.09] ^] x	14.2] ^] x	0.76	X	0.7] =	26.64	(75)
Northeast 0.9x	0.77]	5.09	l ^ l x	9.21] ^] _x	0.76	×	0.7]	17.29	(75)
Northeast _{0.9x}	0.77]	5.09] ^] x	9.21] ^] _x	0.76	x	0.7]	17.29	(75)
Southwest _{0.9x}	0.77] x	4.86] ^] _x	36.79] ^]	0.76	X	0.7]] ₌	65.93	(79)
Southwest _{0.9x}	0.77] x	5.01] ^] _X	36.79]]	0.76	x	0.7]] ₌	67.96	(79)
Southwest _{0.9x}	0.77] x	4.86] x	36.79]]	0.76	X	0.7]] ₌	65.93	(79)
Southwest _{0.9x}	0.77]]	4.86] x	36.79]]	0.76	X	0.7]] ₌	65.93	(79)
Southwest _{0.9x}	0.77] x	4.86) x	62.67]]	0.76	x	0.7]] _	112.3	(79)
Southwest _{0.9x}	0.77]]	5.01	l x	62.67]]	0.76	X	0.7]] ₌	115.76	(79)
Southwest _{0.9x}	0.77]]	4.86) x	62.67]]	0.76	X	0.7]] _	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	l X	62.67	<u> </u> 	0.76	X	0.7] =	112.3	(79)
Southwest _{0.9x}	0.77	X	4.86	X	85.75	<u>.</u>]	0.76	X	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77) x	5.01	x	85.75	i	0.76	X	0.7	j =	158.39	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	X	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	85.75	j	0.76	х	0.7	j =	153.65	(79)
Southwest _{0.9x}	0.77	X	4.86	x	106.25	j	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	X	5.01	×	106.25	ĺ	0.76	х	0.7	j =	196.25	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	j	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	x	4.86	x	106.25	j	0.76	x	0.7	j =	190.38	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01	ĺ	0.76	x	0.7	j =	213.24	(79)
Southwest _{0.9x}	0.77	x	5.01	x	119.01	ĺ	0.76	х	0.7	Ī =	219.82	(79)
Southwest _{0.9x}	0.77	x	4.86	x	119.01]	0.76	x	0.7] =	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	119.01]	0.76	X	0.7	=	213.24	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	X	5.01	x	118.15]	0.76	x	0.7	=	218.23	(79)
Southwest _{0.9x}	0.77	X	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	118.15]	0.76	x	0.7	=	211.7	(79)
Southwest _{0.9x}	0.77	x	4.86	x	113.91]	0.76	x	0.7	=	204.1	(79)
Southwest _{0.9x}	0.77	X	5.01	x	113.91]	0.76	x	0.7] =	210.4	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7] =	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	x	113.91]	0.76	x	0.7] =	204.1	(79)
Southwest _{0.9x}	0.77	X	4.86	x	104.39]	0.76	x	0.7] =	187.04	(79)

Southwest _{0.9x}	0.77	٦	5.04	1 .,	104.00	1	0.70	l		1	400.00	7(70)
Southwest _{0.9x}	0.77	X	5.01	X	104.39] 1	0.76	X	0.7] = 1	192.82	(79)
Southwest _{0.9x}	0.77	X	4.86	X	104.39] 1	0.76	X	0.7] = 1	187.04	(79)
<u> </u>	0.77	X	4.86] X	104.39] 1	0.76	X	0.7] =	187.04	(79)
Southwesto.gx	0.77	X	4.86] X	92.85]	0.76	X	0.7	=	166.37	(79)
Southwest _{0.9x}	0.77	X	5.01	X	92.85]	0.76	X	0.7] =	171.5	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	92.85]	0.76	X	0.7] =	166.37	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27]	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	5.01	X	69.27]	0.76	Х	0.7	=	127.94	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	_	0.76	X	0.7] =	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	69.27	ļ	0.76	X	0.7	=	124.11	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	_	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	5.01	X	44.07]	0.76	X	0.7	=	81.4	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07	<u> </u>	0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	44.07		0.76	X	0.7	=	78.96	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	5.01	X	31.49		0.76	X	0.7	=	58.16	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49		0.76	X	0.7	=	56.42	(79)
Southwest _{0.9x}	0.77	X	4.86	X	31.49]	0.76	X	0.7	=	56.42	(79)
Northwest _{0.9x}	0.77	X	1.4	X	11.28	X	0.76	X	0.7	=	5.82	(81)
Northwest _{0.9x}	0.77	X	1.4	X	22.97	X	0.76	X	0.7	=	11.85	(81)
Northwest _{0.9x}	0.77	X	1.4	X	41.38	x	0.76	x	0.7	=	21.36	(81)
Northwest _{0.9x}	0.77	X	1.4	X	67.96	x	0.76	x	0.7	=	35.08	(81)
Northwest _{0.9x}	0.77	X	1.4	X	91.35	x	0.76	x	0.7	=	47.15	(81)
Northwest _{0.9x}	0.77	X	1.4	X	97.38	x	0.76	x	0.7	=	50.26	(81)
Northwest _{0.9x}	0.77	X	1.4	X	91.1	x	0.76	x	0.7	=	47.02	(81)
Northwest _{0.9x}	0.77	X	1.4	X	72.63	x	0.76	x	0.7	=	37.49	(81)
Northwest _{0.9x}	0.77	X	1.4	X	50.42	x	0.76	x	0.7	=	26.02	(81)
Northwest _{0.9x}	0.77	X	1.4	X	28.07	x	0.76	X	0.7	=	14.49	(81)
Northwest 0.9x	0.77	X	1.4	X	14.2	x	0.76	x	0.7	=	7.33	(81)
Northwest _{0.9x}	0.77	X	1.4	X	9.21	x	0.76	x	0.7	=	4.76	(81)
Rooflights _{0.9x}	1	X	3.37	X	26	x	0.76	X	0.7	=	41.95	(82)
Rooflights 0.9x	1	X	1.13	X	26	x	0.76	x	0.7	=	14.07	(82)
Rooflights _{0.9x}	1	x	0.98	X	26	x	0.76	x	0.7	=	12.2	(82)
Rooflights _{0.9x}	1	X	3.37	x	54	x	0.76	x	0.7	=	87.13	(82)
Rooflights _{0.9x}	1	X	1.13	x	54	x	0.76	x	0.7	j =	29.22	(82)
Rooflights _{0.9x}	1	X	0.98	x	54	x	0.76	x	0.7	j =	25.34	(82)
Rooflights 0.9x	1	X	3.37	X	96	x	0.76	x	0.7	j =	154.9	(82)
Rooflights _{0.9x}	1	x	1.13	x	96	x	0.76	x	0.7	j =	51.94	(82)
Rooflights _{0.9x}	1	X	0.98	X	96	x	0.76	x	0.7	=	45.05	(82)
Rooflights _{0.9x}	1	X	3.37	X	150	x	0.76	X	0.7	=	242.03	(82)
L		_						•		•		_

_								_									
Rooflights 0.9x	1	x	1.1	3	X	1:	50	X		0.76	X		0.7		=	81.16	(82)
Rooflights 0.9x	1	x	0.9	8	x	1:	50	X		0.76	X		0.7		=	70.38	(82)
Rooflights 0.9x	1	x	3.3	37	x	1	92	X		0.76	X		0.7		=	309.8	(82)
Rooflights 0.9x	1	x	1.1	3	x	1	92	X		0.76	X		0.7		=	103.88	(82)
Rooflights 0.9x	1	Х	0.9	8	x	1	92	x		0.76	X		0.7		=	90.09	(82)
Rooflights _{0.9x}	1	X	3.3	37	X	2	00	x		0.76	X		0.7		=	322.71	(82)
Rooflights 0.9x	1	x	1.1	3	X	2	00	x		0.76	X		0.7		=	108.21	(82)
Rooflights 0.9x	1	X	0.9	8	X	2	00	x		0.76	X		0.7		=	93.84	(82)
Rooflights _{0.9x}	1	x	3.3	37	X	1	89	x		0.76	X		0.7		=	304.96	(82)
Rooflights 0.9x	1	X	1.1	3	X	1	89	x		0.76	X		0.7		=	102.26	(82)
Rooflights 0.9x	1	X	0.9	8	X	1	89	x		0.76	X		0.7		=	88.68	(82)
Rooflights 0.9x	1	X	3.3	37	X	1:	57	x		0.76	X		0.7		=	253.33	(82)
Rooflights 0.9x	1	X	1.1	3	x	1:	57	Īx		0.76	×	F	0.7		=	84.94	(82)
Rooflights 0.9x	1	х	0.9)8	X	1:	57	Īx		0.76	×	Ī	0.7		=	73.67	(82)
Rooflights 0.9x	1	х	3.3	37	x	1	15	X		0.76	×	Ī	0.7		=	185.56	(82)
Rooflights 0.9x	1	х	1.1	3	X	1	15	x		0.76	X	Ī	0.7		=	62.22	(82)
Rooflights 0.9x	1	х	0.9	98	X	1	15	×		0.76	X	F	0.7	ī	=	53.96	(82)
Rooflights 0.9x	1	х	3.3	37	x	(66	×		0.76	×	Ī	0.7		=	106.49	(82)
Rooflights 0.9x	1	х	1.1	3	X	(66	i x		0.76	Ī×	F	0.7		=	35.71	(82)
Rooflights 0.9x	1	X	0.9)8	x	(66	Īx		0.76	i x	F	0.7	i	=	30.97	(82)
Rooflights 0.9x	1	X	3.3	37	x	:	33	j x		0.76	= x	F	0.7	i	=	53.25	(82)
Rooflights 0.9x	1	X	1.1	3	x	:	33	j×		0.76	i x	F	0.7		=	17.85	(82)
Rooflights 0.9x	1	X	0.9	98	x	3	33	j x		0.76	X	F	0.7		=	15.48	(82)
Rooflights _{0.9x}	1	X	3.3	37	x	2	21	j×		0.76	×	F	0.7	i	=	33.88	(82)
Rooflights 0.9x	1	x	1.1	3	X	2	21	j×		0.76	×	F	0.7	一	=	11.36	(82)
Rooflights 0.9x	1	X	0.9	98	X	2	21	i x		0.76	×	F	0.7	Ħ	=	9.85	(82)
_								_				_					
Solar gains in	watts, ca	alculated	for eac	h mont	h			(83)	n = S	um(74)m	(82)r	n					
(83)m= 382.13	692.39	1047.88	1451.08	1753.29	9 17	793.85	1707.53	147	5.95	1187.61	793.	27	465.49	321	1.85		(83)
Total gains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)m ,	watts									•	
(84)m= 838.69	1146.74	1486.63	1864.48	2140.6	5 21	156.31	2053.92	182	8.74	1553.51	1184	.76	886.41	765	5.12		(84)
7. Mean inter	nal temp	erature ((heating	seaso	n)												
Temperature	during h	eating p	eriods ir	n the liv	ing	area fr	om Tal	ble 9), Th	1 (°C)						21	(85)
Utilisation fac	tor for ga	ains for li	iving are	ea, h1,r	n (s	ee Tab	ole 9a)										
Jan	Feb	Mar	Apr	May	$\cdot \top$	Jun	Jul	I A	ug	Sep	O	ct	Nov	D	ес		
(86)m= 0.99	0.98	0.93	0.82	0.64		0.46	0.34	0.	39	0.65	0.9	1	0.99		1		(86)
Mean interna	l tempera	ature in I	iving ar	ea T1 (follo	w step	s 3 to 7	7 in '	Table	e 9c)						•	
(87)m= 21	21	21	21	21	Т	21	21	$\overline{}$	21	21	21		21	2	21]	(87)
Temperature	durina h	eating n	ariade ir	rest o	f dw	ellina t	from Ta	ahla	a T	I 2 (°C)			<u> </u>			J	
(88)m= 19.64	19.64	19.65	19.66	19.66	_	19.67	19.67		.67	19.67	19.6	6	19.66	19	.65]	(88)
` ′	l l							<u> </u>					L		-	I	` '
Utilisation fac	tor for ga	0.91	0.77	welling	$\overline{}$,m (see	0.24		28	0.55	0.8	7	0.98	0.9	99]	(89)
(00)111- 0.33	0.91	0.31	0.11	0.57		0.01	0.24	1 0.	_0	0.00	0.0	•	0.30	0.	-	l	(00)

	19.64	19.65	19.66	of dwelli	19.67	19.67	19.67	19.67	19.66	19.66	19.65		(90
0)m= 19.64	1 10.01	10.00	10.00	10.00	10.01	10.01	10.01		fLA = Livin			0.32	(9 ²
4	-1.4		. ()	.1. 1 .1	ur \		. /4 (1	A) TO					
Mean intern		 							20.00	20.00	20.00		(0)
2)m= 20.08	20.08	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.09		(92
Apply adjus	1						 		. 	20.00	20.00		(93
3)m= 20.08	20.08	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.09		(30
8. Space he	· ·					44 6	T 11 0	-11	: /-	70)			
Set Ti to the he utilisatio			•		ed at ste	ep 11 of	rable 9	o, so tha	it II,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
المقط Jtilisation fa			<u> </u>	iviay	Juli	Jui	Aug	ОСР	000	1101	Dec		
4)m= 0.99	0.97	0.92	0.79	0.59	0.4	0.27	0.32	0.58	0.89	0.98	0.99		(9
Jseful gains		ll		l		J	1		1				`
5)m= 832.11		1370.52	<u> </u>		863.9	556.52	585.63	902.6	1051.95	869.95	760.89		(9:
Monthly ave						000.02	000.00	002.0		000.00			`
6)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		(9
Heat loss ra		oxdot											(-
7)m= 2585.2		2215.43		1351.97	877.84	558.63	589.75	960.62	1529.16	2100.81	2579.96		(9
Space heati										l .	2070.00		(-
3)m= 1304.3		628.61	243.55	65.14	0	0.02	0	0	355.05	886.22	1353.39		
1004.0	010.01	020.01	240.00	00.14	Ŭ	Ŭ		l per year		!	!	5753.07	— (9
									trvvii/veai			3733.07	
	_						Tota	ii poi youi	(, ,	<i>,</i> •••••••	O/15,912 —		닠`
Space heati	ng require	ement in	kWh/m²	²/year			1014	i poi you	(, G a(6	5)15,912	54.89	= `
•	• .				ystems i	ncluding			(**************************************	, Ga(c	5)15,912		(9
a. Energy re Space heat	equiremer	nts – Indi	vidual h	eating sy			micro-C		(,	,	O)13,912		(9
a. Energy re Space heat	equiremer	nts – Indi	vidual h	eating sy			micro-C		(,	, ca(c	O)13,912		= `
a. Energy re Space heat Fraction of s	equiremer ing: space hea	nts – Indi at from se	vidual h	eating sy		system	micro-C	CHP)		,	O)Io.a12	54.89	(9
a. Energy respectively. Space heate Fraction of sectio	equiremer ing: space hea space hea	nts – Indi at from se at from m	vidual h econdar nain syst	eating sy y/supple em(s)		system	micro-C	CHP) - (201) =		,	O)Iola12	54.89	(9)
a. Energy reaction of services	equirement ing: space heat space heat otal heati	nts - Indi at from se at from m ng from 1	vidual h econdary nain syst main sys	eating sy y/supple em(s) stem 1		system	(202) = 1	CHP) - (201) =		, - 0(0	()	0 1 1	(9)
a. Energy respectively. Space heater action of seriaction of the Efficiency of the	equirementing: space head space head otal heatiful main space	nts – Indi at from se at from m ng from i ace heati	vidual h econdary nain syst main systen	eating sy y/supple em(s) stem 1	mentary	system	(202) = 1	CHP) - (201) =			O)Iola12	0 1 1 211.14	(9)
Energy reaction of services of the Efficiency of Efficienc	equirementing: space head space head otal heatification main space seconda	at from se at from m at from m ag from it ace heati	vidual hecondary nain systemain systemain systementar	eating sy y/supple em(s) stem 1 em 1	mentary	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =			0 1 1 211.14	(9)
a. Energy re Space heat Fraction of services Fraction of te Efficiency of Jan	equirement ing: space heat space heat otal heat if main space seconda	at from set from ming from it ace heating ry/supplement	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1	CHP) - (201) =		Nov	Dec	0 1 1 211.14	(9)
Energy respectively. Energy respectively.	equirement ing: space heat space heat otal heat if main space seconda Feb ng require	at from set from ming from it ace heating ry/supplement (comment (comment)	vidual h econdary nain systemain systementar Apr alculate	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system n, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov	Dec	0 1 1 211.14	(9)
Energy reaction of seriod of the Efficiency of Seriod of Seriod of the Efficiency of Seriod of S	equirement ing: space heat space heat otal heat if main space seconda Feb ng require	at from set from ming from it ace heating ry/supplement	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =			0 1 1 211.14	(9)
Energy respectively. Space heater action of serection of the energy of	equirement ing: space heat otal heat if main space seconda Feb ng require 3 916.81	at from set at from many from the ace heating ry/supplement (c. 628.61	vidual hecondary nain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14	mentary g system Jun	system n, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov	Dec	0 1 1 211.14	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively.	equirement ing: space heat otal heat if main space seconda Feb ng require 1916.81 8)m x (20	at from set at from many from the ace heating ry/supplement (c. 628.61	vidual hecondary nain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14	mentary g system Jun	system n, % Jul	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 355.05	Nov 886.22	Dec 1353.39	0 1 1 211.14	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively.	equirement ing: space heat otal heat if main space seconda Feb ng require 1916.81 8)m x (20	at from set from many from mace heating ry/supplement (compared for face fo	vidual hecondary nain systemain systementar Apr alculated 243.55 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = (204) = 0	CHP) - (201) = 02) × [1 - 6	(203)] = Oct 355.05	Nov 886.22	Dec 1353.39	0 1 1 211.14	(9) (9) (9) (9) (9) (9) (9) (9) (9) (9)
Energy respectively. Energy respectively. Energy respectively. Energy respectively. Fraction of struction of struction of struction of struction of struction. Efficiency of Jan. Energy respectively. Fraction of struction of struction. Jan. Energy respectively.	equirement ing: space heat otal heat if main space secondar if sec	at from set from mace heating from Mar ement (c. 628.61 [297.72]	vidual hecondary nain systemain systematar Apr alculater 243.55 00 ÷ (20 115.35	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 355.05	Nov 886.22	Dec 1353.39	0 1 1 211.14 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively. Energy respectively. Eraction of services of the control of the co	equirement ing: space heat space heat otal heat if main space if seconda Feb ng require 916.81 8)m x (20 434.22 ng fuel (s	at from set at from many from in the set of	vidual hecondary nain systemain systemain systematar Apr alculated 243.55 00 ÷ (20 115.35	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 355.05	Nov 886.22	Dec 1353.39	0 1 1 211.14 0 kWh/ye	(9)
Energy respectively. Space heater action of serection of serection of the energy of t	equirement ing: space heat space heat otal heat if main space if seconda Feb ng require 916.81 8)m x (20 434.22 ng fuel (s	at from set at from many from in the set of	vidual hecondary nain systemain systemain systematar Apr alculated 243.55 00 ÷ (20 115.35	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (204) = (204) = 0	Sep 0	(203)] = Oct 355.05	Nov 886.22	Dec 1353.39	0 1 1 211.14 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Space heati 1304.3 111)m = {[(9 617.74 Space heati {[(98)m x (2	equirement ing: space heat space heat otal heat if main space is secondary in the secondary	at from set from mace heating from the material	vidual hecondary nain systemain systematar Apr alculater 243.55 00 ÷ (20 115.35	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14 06) 30.85	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 355.05 168.16 ar) = Sum(2	Nov 886.22 419.73 211) _{15,1012}	Dec 1353.39 640.99	0 1 1 211.14 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively. Energy respectively. Energy respectively. Fraction of struction of struction of struction of struction of struction. Energy respectively. Fraction of struction of struction of struction of struction. Jan. Energy respectively. Fraction of struction of struction of struction. Jan. Energy respectively.	equirement ing: space heat space heat otal heat if main space seconda Feb ng require 916.81 8)m x (20 434.22 ng fuel (second)] } x 1	at from set from mace heating from the material	vidual hecondary nain systemain systematar Apr alculater 243.55 00 ÷ (20 115.35	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 65.14 06) 30.85	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 355.05 168.16 ar) = Sum(2	Nov 886.22 419.73 211) _{15,1012}	Dec 1353.39 640.99	0 1 1 211.14 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Energy respectively.	equirement ing: space heat space heat otal heat if main space if secondary in the secondary	at from set from many from	vidual hecondary nain systemain systematra Apr alculated 243.55 00 ÷ (20 115.35	eating syly/supple em(s) stem 1 em 1 y heating May d above 65.14 06) 30.85	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 355.05 168.16 ar) = Sum(2	Nov 886.22 419.73 211) _{15,1012}	Dec 1353.39 640.99	0 1 1 211.14 0 kWh/ye	(9) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Energy respectively. Space heater action of serection of serection of the energy of t	equirement ing: space heat space heat otal heat if main space is secondary in the secondary	at from set from many from	vidual hecondary nain systemain systematra Apr alculated 243.55 00 ÷ (20 115.35	eating syly/supple em(s) stem 1 em 1 y heating May d above 65.14 06) 30.85	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	Sep 0 0 0 0 0 0 0 0 0 0 0 0 0	(203)] = Oct 355.05 168.16 ar) = Sum(2	Nov 886.22 419.73 211) _{15,1012}	Dec 1353.39 640.99	0 1 1 211.14 0 kWh/ye	(9) (9) (9) (9) (9) (9) (9) (9) (9) (9)

							1	
(217)m= 100 100 100 100 100	100 100	100	100	100	100	100		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 192.69 169.36 176.75 156.9 152.63 1	134.77 127.9	142.46	142.87	162.77	174.06	187.53		
(2.6)			I = Sum(2		1	107.00	1920.69	(219)
Annual totals					Wh/yeaı	r '	kWh/yeaı	┛` ′
Space heating fuel used, main system 1					•		2724.77	
Water heating fuel used							1920.69	Ħ
Electricity for pumps, fans and electric keep-hot						'		
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =	:		0	(231)
Electricity for lighting							415.46	(232)
Electricity generated by PVs							-778.07	(233)
12a. CO2 emissions – Individual heating system	ns including m	icro-CHF)					
	Energy kWh/year				ion fac 2/kWh	tor	Emissions	
Space heating (main system 1)	Energy kWh/year			Emiss kg CO	2/kWh	tor =	Emissions kg CO2/ye	
Space heating (main system 1) Space heating (secondary)	kWh/yea			kg CO	2/kWh		kg CO2/ye	ar
• • • • • • • • • • • • • • • • • • • •	kWh/year			kg CO	2/kWh	=	kg CO2/ye	ar (261)
Space heating (secondary)	kWh/year (211) x (215) x			0.5	2/kWh	= =	kg CO2/ye	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x			0.5	2/kWh 19 19 19	= =	kg CO2/ye 1414.16 0 996.84	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262)			0.5 0.5 0.5	2/kWh 19 19 19	= =	kg CO2/ye 1414.16 0 996.84 2411	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) (231) x			0.5 0.5 0.5	2/kWh 19 19 19 19	=	kg CO2/ye 1414.16 0 996.84 2411 0	(261) (263) (264) (265) (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	kWh/year (211) x (215) x (219) x (261) + (262) (231) x		(264) =	0.5 0.5 0.5 0.5	2/kWh 19 19 19 19 19	=	kg CO2/ye 1414.16 0 996.84 2411 0 215.62	(261) (263) (264) (265) (267) (268)

El rating (section 14)

(274)

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12. Appendix B – Overheating report

Calculated by Stroma FSAP 2012 program, produced and printed on 14 December 2018

Dwelling type: End-terrace House

Located in: England Region: Thames valley

Cross ventilation possible: Yes Number of storeys: 3

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Medium

Night ventilation: False Blinds, curtains, shutters: None

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Summer ventilation heat loss coefficient: (P1) 519.13

Transmission heat loss coefficient: 117.3

Summer heat loss coefficient: 636.46 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South West (Window 1)	0	1
South West (Window 2)	0	1
North West (Window 3)	0	1
South West (Window 4)	0	1
North East (Terrace wind	10 w)	1
South West (Window 5)	0	1
North West (Window 6)	0	1
North East (Entrance win	ndow)	1
Horizontal (Skylight 1)	0	1
Horizontal (Skylight 2)	0	1
Horizontal (Kitchen walk	Økylight)	1

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (Window 1)	1	0.9	1	0.9	(P8)
South West (Window 2)	1	0.9	1	0.9	(P8)
North West (Window 3)	1	0.9	1	0.9	(P8)
South West (Window 4)	1	0.9	1	0.9	(P8)
North East (Terrace wind	Φw)	0.9	1	0.9	(P8)
South West (Window 5)	1	0.9	1	0.9	(P8)
North West (Window 6)	1	0.9	1	0.9	(P8)
North East (Entrance wind	đow)	0.9	1	0.9	(P8)
Horizontal (Skylight 1)	1	1	1	1	(P8)
Horizontal (Skylight 2)	1	1	1	1	(P8)
Horizontal (Kitchen walk §	skylight)	1	1	1	(P8)

Orientation	Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
South West (Window 1) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
South West (Window 2) 0.9 x	5.19	119.92	0.76	0.7	0.9	268.2

North West (Window 3) 0.9 x	1.4	98.85	0.76	0.7	0.9	59.63
South West (Window 4) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
North East (Terrace window)x	7.38	98.85	0.76	0.7	0.9	314.35
South West (Window 5) 0.9 x	5.83	119.92	0.76	0.7	0.9	301.28
North West (Window 6) 0.9 x	3.36	98.85	0.76	0.7	0.9	143.12
North East (Entrance window)	6.71	98.85	0.76	0.7	0.9	285.81
1 x	3.35	203	0.76	0.7	1	325.61
1 x	1.13	203	0.76	0.7	1	109.83
1 x	1.37	203	0.76	0.7	1	133.16
					Total	2443.28 (P3/P4)

Internal gains:

	June	July	August
Internal gains	541.38	519.72	528.92
Total summer gains	3141.07	2963	2670.2 (P5)
Summer gain/loss ratio	4.94	4.66	4.2 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	21.19	22.81	22.25 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium

Calculated by Stroma FSAP 2012 program, produced and printed on 14 December 2018

Property Details: Unit 02

Dwelling type:Mid-terrace House

Located in:EnglandRegion:Thames valley

Cross ventilation possible: Yes Number of storeys: 3

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Medium

Night ventilation: False **Blinds, curtains, shutters:** None

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient: 489.04 (P1)

Transmission heat loss coefficient: 86.2

Summer heat loss coefficient: 575.22 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs
South West (Window 1)	0	1
South West (Window 2)	0	1
North West (Window 3)	0	1
South West (Window 4)	0	1
North East (Terrace wind	0 w)	1
South West (Window 5)	0	1
North East (Entrance win	dow)	1
Horizontal (Skylight 1)	0	1
Horizontal (Skylight 2)	0	1
Horizontal (Kitchen walk	©kylight)	1

Solar shading:

Orientation: Z	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (Window 1) 1	1	0.9	1	0.9	(P8)
South West (Window 2) 1	1	0.9	1	0.9	(P8)
North West (Window 3) 1	1	0.9	1	0.9	(P8)
South West (Window 4) 1	1	0.9	1	0.9	(P8)
North East (Terrace wind	bw)	0.9	1	0.9	(P8)
South West (Window 5) 1	1	0.9	1	0.9	(P8)
North East (Entrance wind	llow)	0.9	1	0.9	(P8)
Horizontal (Skylight 1) 1	1	1	1	1	(P8)
Horizontal (Skylight 2) 1	1	1	1	1	(P8)
Horizontal (Kitchen walk §	lkylight)	1	1	1	(P8)

Solar gains:

Orientation	Area	Flux	g_{-}	FF	Shading	Gains
South West (Window 1) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
South West (Window 2) 0.9 x	5.21	119.92	0.76	0.7	0.9	269.24
North West (Window 3) 0.9 x	1.4	98.85	0.76	0.7	0.9	59.63
South West (Window 4) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15

				7	Total	2065.6 (P3/P4)
1 x	0.98	203	0.76	0.7	1	95.25
1 x	1.13	203	0.76	0.7	1	109.83
1 x	3.37	203	0.76	0.7	1	327.55
North East (Entrance window)	5.29	98.85	0.76	0.7	0.9	225.32
South West (Window 5) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
North East (Terrace wind₀)x	5.29	98.85	0.76	0.7	0.9	225.32

Internal gains:

	June	July	August
Internal gains	528.57	507.5	516.56
Total summer gains	2722.39	2573.1	2341.99 (P5)
Summer gain/loss ratio	4.73	4.47	4.07 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	20.98	22.62	22.12 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium

Calculated by Stroma FSAP 2012 program, produced and printed on 14 December 2018

Dwelling type: Mid-terrace House

Located in: England Region: Thames valley

Cross ventilation possible: Yes Number of storeys: 3

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Medium

Night ventilation: False Blinds, curtains, shutters: None

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Summer ventilation heat loss coefficient: (P1) 491.9

Transmission heat loss coefficient: 86.4

Summer heat loss coefficient: 578.31 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South West (Window 1)	0	1
South West (Window 2)	0	1
North West (Window 3)	0	1
South West (Window 4)	0	1
North East (Terrace wind	d 0 w)	1
South West (Window 5)	0	1
North East (Entrance wir	n d ow)	1
Horizontal (Skylight 1)	0	1
Horizontal (Skylight 2)	0	1
Horizontal (Kitchen walk	©kylight)	1

Orientation: Z	blinds:	Solar access:	Overhangs:	Z summer:	
South West (Window 1) 1		0.9	1	0.9	(P8)
South West (Window 2) 1		0.9	1	0.9	(P8)
North West (Window 3) 1		0.9	1	0.9	(P8)
South West (Window 4) 1		0.9	1	0.9	(P8)
North East (Terrace window	N)	0.9	1	0.9	(P8)
South West (Window 5) 1		0.9	1	0.9	(P8)
North East (Entrance windo	ow)	0.9	1	0.9	(P8)
Horizontal (Skylight 1) 1		1	1	1	(P8)
Horizontal (Skylight 2) 1		1	1	1	(P8)
Horizontal (Kitchen walk \$k	ylight)	1	1	1	(P8)

Orientation	Area	Flux	g _	FF	Shading	Gains
South West (Window 1) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
South West (Window 2) 0.9 x	5.21	119.92	0.76	0.7	0.9	269.24
North West (Window 3) 0.9 x	1.4	98.85	0.76	0.7	0.9	59.63
South West (Window 4) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15

				7	Total	2065.6 (P3/P4)
1 x	0.98	203	0.76	0.7	1	95.25
1 x	1.13	203	0.76	0.7	1	109.83
1 x	3.37	203	0.76	0.7	1	327.55
North East (Entrance window)	5.29	98.85	0.76	0.7	0.9	225.32
South West (Window 5) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
North East (Terrace wind₀)x	5.29	98.85	0.76	0.7	0.9	225.32

Internal gains:

	June	July	August
Internal gains	530.2	509.05	518.13
Total summer gains	2724.01	2574.65	2343.56 (P5)
Summer gain/loss ratio	4.71	4.45	4.05 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	20.96	22.6	22.1 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium

Calculated by Stroma FSAP 2012 program, produced and printed on 14 December 2018

Dwelling type: Mid-terrace House

Located in: England Region: Thames valley

Cross ventilation possible: Yes Number of storeys: 3

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Medium

Night ventilation: False Blinds, curtains, shutters: None

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Summer ventilation heat loss coefficient: (P1) 495.46

Transmission heat loss coefficient: 86.7

Summer heat loss coefficient: 582.17 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South West (Window 1)	0	1
South West (Window 2)	0	1
North West (Window 3)	0	1
South West (Window 4)	0	1
North East (Terrace wind	d 0 w)	1
South West (Window 5)	0	1
North East (Entrance wir	n d ow)	1
Horizontal (Skylight 1)	0	1
Horizontal (Skylight 2)	0	1
Horizontal (Kitchen walk	S kylight)	1

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (Window 1)	1	0.9	1	0.9	(P8)
South West (Window 2)	1	0.9	1	0.9	(P8)
North West (Window 3)	1	0.9	1	0.9	(P8)
South West (Window 4)	1	0.9	1	0.9	(P8)
North East (Terrace wind	Φw)	0.9	1	0.9	(P8)
South West (Window 5)	1	0.9	1	0.9	(P8)
North East (Entrance wind	dow)	0.9	1	0.9	(P8)
Horizontal (Skylight 1)	1	1	1	1	(P8)
Horizontal (Skylight 2)	1	1	1	1	(P8)
Horizontal (Kitchen walk s	skylight)	1	1	1	(P8)

Orientation	Area	Flux	g _	FF	Shading	Gains
South West (Window 1) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
South West (Window 2) 0.9 x	5.21	119.92	0.76	0.7	0.9	269.24
North West (Window 3) 0.9 x	1.4	98.85	0.76	0.7	0.9	59.63
South West (Window 4) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15

					Total	2065.6 (P3/P4)
1 x	0.98	203	0.76	0.7	1	95.25
1 x	1.13	203	0.76	0.7	1	109.83
1 x	3.37	203	0.76	0.7	1	327.55
North East (Entrance window)	5.29	98.85	0.76	0.7	0.9	225.32
South West (Window 5) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
North East (Terrace wind 0) x	5.29	98.85	0.76	0.7	0.9	225.32

Internal gains:

	June	July	August
Internal gains	532.18	510.94	520.04
Total summer gains	2725.99	2576.54	2345.47 (P5)
Summer gain/loss ratio	4.68	4.43	4.03 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	20.93	22.58	22.08 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium

Assessment of likelihood of high internal temperature: Me

<u>Medium</u>

Calculated by Stroma FSAP 2012 program, produced and printed on 14 December 2018

Dwelling type: Mid-terrace House

Located in: England Region: Thames valley

Cross ventilation possible: Yes Number of storeys: 3

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Medium

Night ventilation: False Blinds, curtains, shutters: None

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Summer ventilation heat loss coefficient: (P1) 495.93

Transmission heat loss coefficient: 86.7

Summer heat loss coefficient: 582.58 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South West (Window 1)	0	1
South West (Window 2)	0	1
North West (Window 3)	0	1
South West (Window 4)	0	1
North East (Terrace wind	d 0 w)	1
South West (Window 5)	0	1
North East (Entrance wir	n d ow)	1
Horizontal (Skylight 1)	0	1
Horizontal (Skylight 2)	0	1
Horizontal (Kitchen walk	©kylight)	1

Orientation: Z	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (Window 1) 1		0.9	1	0.9	(P8)
South West (Window 2) 1		0.9	1	0.9	(P8)
North West (Window 3) 1		0.9	1	0.9	(P8)
South West (Window 4) 1		0.9	1	0.9	(P8)
North East (Terrace wind	bw)	0.9	1	0.9	(P8)
South West (Window 5) 1		0.9	1	0.9	(P8)
North East (Entrance wind	dow)	0.9	1	0.9	(P8)
Horizontal (Skylight 1) 1		1	1	1	(P8)
Horizontal (Skylight 2) 1		1	1	1	(P8)
Horizontal (Kitchen walk \$	kylight)	1	1	1	(P8)

Orientation	Area	Flux	g_{-}	FF	Shading	Gains
South West (Window 1) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
South West (Window 2) 0.9 x	5.21	119.92	0.76	0.7	0.9	269.24
North West (Window 3) 0.9 x	1.4	98.85	0.76	0.7	0.9	59.63
South West (Window 4) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15

					Total	2065.6 (P3/P4)
1 x	0.98	203	0.76	0.7	1	95.25
1 x	1.13	203	0.76	0.7	1	109.83
1 x	3.37	203	0.76	0.7	1	327.55
North East (Entrance winds)	5.29	98.85	0.76	0.7	0.9	225.32
South West (Window 5) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
North East (Terrace wind₀)x	5.29	98.85	0.76	0.7	0.9	225.32

Internal gains:

	June	July	August
Internal gains	532.36	511.11	520.22
Total summer gains	2726.18	2576.72	2345.65 (P5)
Summer gain/loss ratio	4.68	4.42	4.03 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	20.93	22.57	22.08 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium

Calculated by Stroma FSAP 2012 program, produced and printed on 14 December 2018

Property Details: Unit 06

Dwelling type: End-terrace House

Located in:EnglandRegion:Thames valley

Cross ventilation possible: Yes Number of storeys: 3

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Medium

Night ventilation:FalseBlinds, curtains, shutters:None

Ventilation rate during hot weather (ach): 4 (Windows open half the time)

Overheating Details

Summer ventilation heat loss coefficient: 477.73 (P1)

Transmission heat loss coefficient: 94.6

Summer heat loss coefficient: 572.35 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South West (Window 1)	0	1
South West (Window 2)	0	1
North West (Window 3)	0	1
South West (Window 4)	0	1
North East (Terrace wind	10 w)	1
South West (Window 5)	0	1
North East (Entrance win	ndow)	1
Horizontal (Skylight 1)	0	1
Horizontal (Skylight 2)	0	1
Horizontal (Kitchen walk	S kylight)	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (Window 1)	1	0.9	1	0.9	(P8)
South West (Window 2)	1	0.9	1	0.9	(P8)
North West (Window 3)	1	0.9	1	0.9	(P8)
South West (Window 4)	1	0.9	1	0.9	(P8)
North East (Terrace wind	dow)	0.9	1	0.9	(P8)
South West (Window 5)	1	0.9	1	0.9	(P8)
North East (Entrance wir	ndow)	0.9	1	0.9	(P8)
Horizontal (Skylight 1)	1	1	1	1	(P8)
Horizontal (Skylight 2)	1	1	1	1	(P8)
Horizontal (Kitchen walk	\$kylight)	1	1	1	(P8)

Solar gains:

Orientation	Area	Flux	g _	FF	Shading	Gains
South West (Window 1) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
South West (Window 2) 0.9 x	5.01	119.92	0.76	0.7	0.9	258.9
North West (Window 3) 0.9 x	1.4	98.85	0.76	0.7	0.9	59.63
South West (Window 4) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15

				•	Total	2038.23 (P3/P4)
1 x	0.98	203	0.76	0.7	1	95.25
1 x	1.13	203	0.76	0.7	1	109.83
1 x	3.37	203	0.76	0.7	1	327.55
North East (Entrance window)	5.09	98.85	0.76	0.7	0.9	216.81
South West (Window 5) 0.9 x	4.86	119.92	0.76	0.7	0.9	251.15
North East (Terrace window)x	5.09	98.85	0.76	0.7	0.9	216.81

Internal gains:

	June	July	August
Internal gains	522.96	502.14	511.13
Total summer gains	2687.53	2540.37	2312.98 (P5)
Summer gain/loss ratio	4.7	4.44	4.04 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	20.95	22.59	22.09 (P7)
Likelihood of high internal temperature	Slight	Medium	Medium