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1.0 Executive Summary

The proposed development project at Best Court involves the redevelopment of the existing site to create a terrace of 8 new dwellings arranged over 3 stories.

It has been designed to achieve the highest of environmental performance standards following the Energy Hierarchy as set down by the London Plan and the London Borough of Newham's local plan policies.

The report takes on board the latest GLA guidance on writing energy statements as well as taking into account matters raised with the newly adopted London Plan.

eb7 Sustainability Ltd have been appointed to develop a strategy and advise how the proposed development of new build apartments will comply with these requirements.

A 'Lean, Clean, Green' has been adopted and the development achieves an overall improvement (DER/TER) in regulated emissions at over **71%** above Part L 2013 standard, through the adoption of high standards of insulation, heat pump driven heating and hot water systems and a roof mounted PV array.

Taking into account the embedded carbon within the demolition and construction works, the development still achieves an overall reduction in its construction and operation carbon footprint at over **19%**.

As such, this non-major domestic development will meet with both Local Plan and London Plan requirements.



2.0 The Site & Proposal

The site is currently occupied an existing residential block, arranged over 3 floors.

The proposal for the site includes the demolition of the existing building and redevelopment of the site to create a terrace of 8 residential units, with associated refuse storage, cycle storage, and amenity space.

2.1 Local Planning Context

The project sits within the London Borough of Newham (Newham).

Newham's Local Plan 2018 combines and updates the Borough's previous Core Strategy (2012) and Detailed Sites & Policies DPD (2016).

Key polices are:-

SC1 - Environmental Resilience

Proposals that address the following strategic principles, spatial strategy and design and technical criteria will be supported:

- 1. Strategic Principles:
- a. In design, construction, and operation, development must respond to the known effects of climate change, including the likelihood of extreme weather events, geohazard risks, increased water scarcity and warmer temperatures;
- b. Development must be resource-efficient, recognising the increasing pressure on resources due to population growth and environmental stress as well as the economic opportunities of 'waste';
- c. Bolster the Council's wider resilience agenda, development will promote local production (notably food growing), procurement, and labour (see J3);
- d. Ameliorate past environmental degradation, (as evident in water quality, habitat loss and contaminated land) to enhance site potential and minimise future degradation;
- e. Encourage the take-up of opportunities to improve resource efficiency in existing homes and buildings through retrofitting, subject to the sensitivities identified in SP5; and
- f. Development should take advantage of linked opportunities in sustainable design and minimise conflict between different strands, notably through:
- i. The biodiversity, pollution control and flood-reduction benefits of surface water attenuation measures as per the SUDS hierarchy (see SC3);
- ii. The temperature-regulation and surface water attenuation benefits of biodiversity enhancements (see SC4);



- iii. Avoiding conflict with air quality objectives (see SC5);
- iv. The opportunity to integrate food growing, including consideration as a temporary use.
- 3. Design and technical criteria:
- a. Development will achieve at least the following standards (Table 11), or equivalent standards within updated/replacement schemes:
 - Residential London Plan Zero Carbon As per policy SC2
- b. All development will incorporate water efficiency measures to achieve a consumption target of 105 litres or less per head per day (residential) or 'excellent' Wat 01 rating (non-residential development the subject of a BREEAM assessment);
- c. Where contamination is known or suspected, proposals will include adequate investigation of land contamination with remedial works agreed prior to the start of development. Reference to CLR11 Model Procedures for the Management of Land Contamination or subsequent updates should be made;
- d. Development should demonstrate that the risks of overheating have been addressed through design and construction choices, particularly in the case of high density and public realm schemes and in relation to energy and glazing solutions; and
- e. Landscaping schemes will demonstrate consideration of climate change effects through planting choices that are resilient to higher temperatures and scarce water supply.
- SC2 Energy and Zero Carbon

Proposals that address the following strategic principles, spatial strategy and design and technical criteria will be supported:

- 1. Strategic Principles:
- a. All development will minimise and reduce carbon emissions by following the lean, clean, green energy hierarchy; all Major development will meet London Plan Zero Carbon targets; and
- b. Energy planning should contribute to the Council's Resilience agenda in relation to costs and service level in the ongoing provision of energy.
- 2. Spatial Strategy:
- a. The development and expansion of decentralised energy networks (including low-carbon generation, storage and transmission infrastructure) will be a central component of the scale of growth within the Arc of Opportunity; and



- b. Development should be configured to maximise the use of natural and waste energy sources including sunlight/daylight and (where feasible) ground / air / water / waste heat, where otherwise acceptable in terms of environmental impacts.
- 3. Design and technical criteria:
- a. All development is encouraged to incorporate Smart Meter technology that allows occupants to monitor and manage their energy usage. Major development will be required to commit to carrying out post-construction audits demonstrating compliance with CO2 reduction targets and incorporate Smart Meters that deliver monitoring data to the Local Authority for a minimum period of 3 years post-occupation;
- b. Statements setting out how development complies with the above strategic principles and spatial strategy should be provided; all Major development should be accompanied by an Energy Strategy/Assessment that:
- i. Conforms to latest GLA guidance (currently Energy Planning March 2016) and requirements/guidance concerning Zero Carbon;
- ii. Prioritises connection to heat networks (where they exist or planned development is known) and confirms appropriate mechanisms will be put in place to ensure end customers are protected in respect of the price of energy and level of service provided;
- iii. Provides for connection to heat networks in future where connection is not made prior to occupation (including detail of any required retrofitting);
- iv. Demonstrates compliance with air quality standards, including the emissions standards for renewable and low-carbon plant set out in London Plan guidance;

and

- v. Confirms that the risks of overheating have been addressed through the design of the development, as per policy SC1.
- c. Developments connecting to heat networks will provide evidence of ongoing management mechanisms, ensuring end customers are protected in respect of the price of energy and level of service.

2.2 The London Plan

Chapter 9 deals with Sustainable Infrastructure:-

Policy SI1 Improving air quality

A London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:



Development proposals should not:

- a) lead to further deterioration of existing poor air quality
- b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
- c) reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality
- d) create unacceptable risk of high levels of exposure to poor air quality.
- 5) Air Quality Assessments (AQAs) should be submitted with all major developments, unless they can demonstrate that transport and building emissions will be less than the previous or existing use.

Policy SI2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) Be lean: use less energy and manage demand during construction and operation.
- 2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure.
- 3) Be green: generate, store and use renewable energy on-site.

B Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance.

C In meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should aim to achieve 10 per cent, and non-residential development should aim to achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided:

- 1) through a cash in lieu contribution to the relevant borough's carbon offset fund, and/or
- 2) off-site provided that an alternative proposal is identified and delivery is certain.

Policy SI3 Energy infrastructure

D Major development proposals within Heat Network Priority Areas should have a communal heating system

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:



- a) connect to local existing or planned heat networks
- b) use available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)
- c) generate clean heat and/or power from zero-emission sources
- d) use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)
- e) use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)
- f) use ultra-low NOx gas boilers.
- 2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that there is no significant impact on local air quality.
- 3) Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.

Policy SI4 Managing heat risk

A Development proposals should minimise internal heat gain and the impacts of the urban heat island through design, layout, orientation and materials.

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



Policy SI5 Water infrastructure

C Development proposals should:

- 1) minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)
- 2) achieve at least the BREEAM excellent standard (commercial development)
- 3) be encouraged to incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future proofing.

2.3 Reporting Strategy

The project at Best Court – at 8 units – would be considered a non-major scheme and this report is informed accordingly.

The project will comply with the above noted local plan requirements in so much as they apply to the non-major scheme.

However, design team at utilising SAP10 emissions data, in line with the latest GLA guidance on the preparation of energy statements (April 2020).



3.0 Baseline energy results

The first stage of the Mayor's Energy Hierarchy is to consider the baseline energy model.

The following section details the baseline energy requirements for the development – the starting point when considering the energy hierarchy.

3.1 New Build Dwellings

The baseline emission levels – the Target Emission Rate (TER) - is obtained by applying the design to a reference 'notional' building the characteristics of which are set by regulations – SAP2012; The new Part L Building Regulations 2013 came into force on April 2014 and introduced a completely new notional dwelling as detailed below:-

Element or System	Values
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion o 25% of total floor area [1]
External Walls (including opaque elements of curtain walls) [6]	0.18 W/m²K
Party Walls	0.0 W/m ² K
Floor	0.13 W/m ² K
Roof	0.13 W/m²K
Windows, roof windows, glazed rooflights and glazed doors	1.4 W/m²K [2] (Whole window U-value)
	g-value = 0.63 [3]
Opaque doors	1.0 W/m ² K
Semi glazed doors	1.2 W/m²K
Air tightness	5.0 m ³ /hr/m ²
Linear thermal transmittance	Standardised psi values – See SAP Appendix R, except use of y=0.05 W/m²K if the default value of y=0.15 W/m²K is used in the actual dwelling
Ventilation type	Natural (with extract fans) [4]
Air conditioning	None
Element or System	Values
Heating System	Mains gas If combi boiler in actual dwelling, combi boiler; otherwise regular boiler Radiators
	Room sealed
	Fan flue
***	SEDBUK 2009 89.5% efficient
Controls	Time and temperature zone control [5] Weather compensation
50	Modulating boiler with interlock
Hot water storage system	Heated by boiler (regular or combi as above) If cylinder specified in actual dwelling, volume of cylinder in actual dwelling, If combi boiler, no cylinder. Otherwise 150 litres. Located in heated space. Thermostat controlled Separate time control for space and water heating
Primary Pipework	Fully Insulated
Hot water cylinder loss factor (if specified)	Declared loss factor equal or better than 0.85 x (0.2 + 0.051 V2/3) kWh/day
Secondary Space Heating	None
Low Energy Lighting	100% Low Energy Lighting
Thermal Mass Parameter	Medium (TMP=250)



SAP first creates the notional reference building, based upon the same shape and form as the proposed dwelling and applies the above the characteristics as defined in SAP2012.

Once all of the baseline emission rates have been calculated in line with the above Government approved methodologies, they are considered as stage 'zero' of the energy hierarchy as described earlier and Target Emission Rate sets the benchmark for the worst performing, but legally permissible, development.

For the project at Best Court, a sample of 3 houses has been selected at mid and end terrace to offer a representative selection to enable an accurate figure for emissions/m² which can then be applied to the full gross internal residential floor area.

All emissions data in then converted to SAP10 emissions via the use of the GLA SAP10 conversion spreadsheet – attached at **Appendix D**.

3.2 Unregulated Energy Use

The baseline un-regulated energy use for cooking & appliances in the residential units have been calculated using the SAP Section 16 methodology; the same calculation used for Code for Sustainable Homes (CfSH) Ene 7.

Appliances = $E_A = 207.8 \text{ X (TFA X N)}^{0.4714}$

Cooking = (119 + 24N)/TFA

N = no of occupant SAP table 1B

TFA – Total Floor Areas

The SAP10 emissions associated with unregulated energy use per sqm is summarised in Table 1 below

CO₂ emissions -Unit CO₂ emissions -Unregulated Unregulated **Energy Use Energy Use** SAP2012 SAP10 Kg/sqm Kg/sq Sample 1 15.15 6.82 Sample 2 15.15 6.82 Sample 3 15.15 6.82

Table 1 – Unregulated Energy Use

The un-regulated emission rates are added to the baseline regulated emission rates (as calculated under 3.1 above) in order to set the total baseline emission rates before then applying the energy hierarchy in line with The London Plan and Newham policies.



3.3 Demolition and construction impacts

At pre-application stage, there was a specific request for the project to consider:-

"A future application should demonstrate that pollutants released through the demolition and construction period will be successfully offset"

In order to establish the level of pollutants (CO₂), this project has considered the environmental impact via the methodology set out in the Mayor's Whole Life-Cycle Carbon Assessments Guidance - Consultation Draft - October 2018

The framework for appraising the environmental impacts of the built environment is provided by BS EN 15978: 2011: (Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method). It sets out the principles and calculation method for whole life assessment of the environmental impacts from built projects based on life-cycle assessment.

Underpinning BS EN 15978 is the RICS Professional Statement: Whole Life Carbon assessment for the built environment (referred to as the RICS PS for the remainder of this guidance)4. The RICS PS serves as a guide to the practical implementation of the BS EN 15978 principles. It sets out technical details and calculation requirements.

Accordingly, the assessment of the demolition and construction site works - Category A5 Site - follows BS EN 15978 using the RICS PS as the methodology for the WLC assessment, specifically:-

- RICS category major demolition works average deconstruction and demolition process - based upon a gross internal area of the existing structure at 385m²
- Average Site Impacts per project value (RICS2020), based upon construction costs at £2.25million.

Gathering and managing all the necessary whole life carbon information relating to each element of the life cycle is a very detailed and complex process. Fortunately, this is a well-studied topic and there are various databases and tools available which have been developed with this data integrated to allow for representative calculations to be made. The tool eb7 used to undertake the LCA is OneClick LCA.

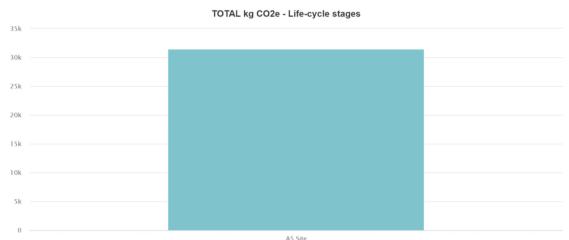


One Click LCA is an online Building Life-Cycle Assessment software. It is an industry-leading platform that is used by many construction industry firms, such as Foster+Partners, Skanska, WSP, Ramboll, Saint-Gobain and Bouygues Construction.

One Click LCA is compliant with BREEAM UK NC 2018 and can achieve up to 10 Mat 01 credits; it has the highest rated LCA software for BREEAM, with a verified maximal Mat 01 score of 100%. The tool is also third-party verified for EN 15978, ISO 21931-1, ISO 21929-1 and for input data for ISO 14040/44 and EN 15804 standards.

The calculations suggest a carbon cost for the demolition and construction works at 31.5tonnes CO_2 (see One Click LCA output below)





This figure will be utilised in the final carbon offset calcualtions

3.4 Baseline Results

The baseline building results for the operation carbon emissions have been calculated, converted to SAP10 emission standards and are presented in Table 2 below.

The Baseline SAP outputs (which summarise the key data) are attached at **Appendix A**, with the conversion calculations at **Appendix D**.

Table 2 – Baseline energy consumption and CO2 emissions

Unit	Target	Unregulated	Total baseline	Total baseline
	Emission Rate	Energy Use	emissions	emissions
	(regulated energy use) Kg/sqm	Kg/sqm	Kg/sqm	Kg
Sample 1	16.70	6.82	23.55	2121.67
Sample 2	15.80	6.82	22.58	2033.99
Sample 3	16.70	6.82	23.55	2121.67
Development Total				16725



4.0 Design for energy efficiency

The first step in the Mayor's 'Energy Hierarchy' as laid out in Chapter 9 of The London Plan, requests that buildings be designed to use improved energy efficiency measures – Be Lean. This will reduce demand for heating, cooling, and lighting, and therefore reduce operational costs while also minimizing associated carbon dioxide emissions.

This section sets out the measures included within the design of the development, to reduce the demand for energy, both gas and electricity (not including energy from renewable sources). The table at the end of this section details the amount of energy used and CO₂ produced by the building after the energy efficiency measures have been included. From these figures the overall reduction in CO₂ emissions, as a result of passive design measures, can be calculated. To achieve reductions in energy demand the following measures have been included within the design and specification of the building:

4.1 Passive Design

The National Planning Policy Framework emphasises the need to take account of climate change over the longer term and plan new developments to avoid increased vulnerability to the range of impacts arising from climate change. The UK Climate Impacts Programme 2009 projections suggest that by the 2080's the UK is likely to experience summer temperatures that are up to 4.2°C higher than they are today.

Accordingly, designers are to ensure buildings are designed and constructed to be comfortable in higher temperatures, without resorting to energy intensive air conditioning.

In line with current GLA Guidance, the project at Best Court has had been designed to ensure the building is not vulnerable to overheating; to instigate consideration of the risk of overheating with the proposed development, the design team have followed the guidance within the London Plan, which consider the control of overheating using the Cooling Hierarchy:-

1. minimise internal heat generation through energy efficient design

The project will be designed to best practice thermal insulation levels as noted, full details of which are noted under 4.3 below.

Not only does good insulation assist in reducing heat losses in the winter, it has a significant impact on preventing heat travelling through the build fabric during the summer.



2. reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and wall

The development site is in a suburban townscape, with an east-west orientation. To the east and west are 3 storey dwelling that will offer an element of shading to the main ground floor living areas from the morning and evening sun.

The livings areas to the main block have the benefit of large glazed areas arranged to the east and west – thus avoiding the peak southern aspect, while also introducing natural daylight and attracting useful solar gain.

There is no directly south facing glazing, avoiding the impact of excessive solar gain from the peak summer sun.

Across the scheme, the glazing to the secondary spaces – bedrooms and bathrooms – is much reduced in keeping with the reduced heat demand associated.

Glazing specification has been a significant consideration as part of the overheating risk mitigation and the specified new glazing will achieve a g-value of 0.55 or better in order to further assist in reducing any limited overheating risk.

3. manage the heat within the building through exposed internal thermal mass and high ceilings

All houses are designed with floor to floor heights at circa 2.4m.

The new build structure is expected to be a traditional brick/block, offering significant thermal mass able to absorb heat during the summer months, which can then be ventilated during the evening or overnight.

4. passive ventilation

Given the relatively quiet suburban location, all glazing is designed to have opening areas to introduce high levels of natural levels of "purge" ventilation to further assist in the reduction of overheating risks in appropriate areas.

All units have the ability to cross ventilate.

5. mechanical ventilation

Given the strategy outlined above, there is no requirement to introduce mechanical ventilation; the project is to be naturally ventilated in line with AD Part F System 1.

4.2 Heating System

The notional heating system considered under the "be lean – use less energy" section of the Energy Hierarchy, will consist of high efficiency condensing gas boilers providing under floor heating and domestic hot water to the project



- High efficiency boiler (89%+ SEDBUK efficiency) & load compensation.
- Insulated primary pipework

To increase the efficiency in the use of the heating system, the following controls will be used to eliminate needless firing of the boilers.

Boilers fitted with load compensation and delayed start thermostats.

4.3 Fabric heat loss

Insulation measures will be utilised to ensure the calculated U-values exceed the Building Regulations minima, with specific guidance taken from the design team: -

- New wall constructions will be of a traditional brick/block construction and will target a U-Value of 0.18w/m²k or better.
- New pitched roof constructions are to be of a warm-roof type, achieving a U-Value of 0.12w/m²k.
- The newly laid floors will achieve a minimum u value of 0.14/0.15w/m²k subject to perimeter/area ratios

Glazing

• The new glazing for windows and doors will be triple glazed with an area weighted average U-Value of 1.2w/m²K or better.

Air Tightness

• The project be tested to 5m³/hr/m² in line with best practice for naturally ventilated dwellings.

Construction Details

 Heat loss via non-repeating thermal bridging within the new build elements will be minimised by the use of Accredited Construction Details for these new build units. An overall Y-Value < 0.07 is targeted.

4.4 Ventilation

As noted above, the project is to be 100% naturally ventilated in line with AD Part F System 1; background (trickle) ventilation, with purge ventilation via opening windows and intermittent extracts to wet rooms.

4.5 Lighting and appliances

The development will incorporate high efficiency light fittings utilising LED lamps.

The use of LED lighting will also minimise the internal gains commonly associated with tungsten and fluorescent lighting systems and thereby further reduce the potential for the houses to overheat.



4.6 Energy efficiency results

The above data has been used to update the SAP models, the Dwelling Emission Rate outputs of which are attached at **Appendix B**, whilst Table 3 sets out the total emissions using SAP10 data.

Table 3 – Energy Efficient emission levels

Unit	Emission Rate	Unregulated	Total baseline	Total baseline
	(regulated	Energy Use	emissions	emissions
	energy use)			
	Kg/sqm	Kg/sqm	Kg/sqm	Kg
Sample 1	14.70	6.82	21.52	1938.37
Sample 2	13.80	6.82	20.63	1858.27
Sample 3	14.70	6.82	21.52	1938.37
	_			
Development				15280
Total				15260

The results show that the energy efficiency measures introduced have resulted in the reduction in CO_2 emissions from the development of **8.64%**.

Regulated emissions have been reduced by **12.23%** via the passive design measures highlighted above - in line with London Plan requirements for Major schemes.



5.0 Supplying Energy Efficiently

The second stage in the Mayor's 'Energy Hierarchy' is to ensure efficient and low carbon energy supply – Be Clean. In particular, this concerns provision of decentralised energy where practical and appropriate.

5.1 Community Heating/Combined Heat and Power (CHP)

The London Plan, Chapter 9, requires that major developments exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure.

Therefore, this report must consider the availability of heat networks in the Newham area The extract from the London Heat Map (reproduced below) identifies that the site is within the Heat Network Priority Area.



Extract from London Heat Map

Clearly there is no potential for the project site to connect to a DEN at any time in the foreseeable future.

As a non-major scheme, there is no obligation to be designed to be DEN connection ready, however, the chosen wet heating system would be compatible with a DEN connection; in particular, the LTHW heating system would provide the necessary flow and (low) return temperatures compatible with DEN connections.

In the medium term, the design team must consider the potential of a stand alone communal system.



5.2 On-site CHP/District Heating

A community heating network comprises a series of insulated pipes used to deliver heat, in the form of hot water or steam, to a number of different locations or dwellings. They range from small, providing heat to a house and a couple of holiday cottages for example, to large scale systems supplying housing estates or blocks of flats.

The heat production facility for a DH scheme is generally considered to include heat only boilers (HOB) and/or the production of both electricity and heat i.e. CHP.

CHP systems are essentially fossil fuel fired electricity generators that use the heat byproduct to provide space and water heating. The electricity generated can be used directly within the host buildings or sold to electricity suppliers on the national grid.

CHP is, as a rule of thumb, is only operated as a base load as, depending on the technology, it may be difficult and/or inefficient to operate according to daily variations in demand. In a well-designed district heating network heat from CHP will provide between 60% and 80% of the annual baseline heat (heating and hot water) requirement with heat-only boiler plants providing the peak load and back-up. To maximise efficiency of the engine it needs to run for at least 17 hours a day; therefore, the heat load needs to be present for this period.

Clearly, as a small scale residential development, with only the limited year round DHW demand to support a CHP installation (approx. 2-4 hours per day in the May – October period), the economy of scale, in terms of year-round demand, simply isn't present and as such the potential use of on-site CHP is very limited.

We must also consider the net carbon benefits from such a system as the decarbonisation of national grid dilutes the benefits obtained from the higher efficiency of larger-scale CHP led system.

Reference is made to the latest CIBSE Symposium on the topic; "An operational lifetime assessment of the carbon performance of gas fired CHP led district heating" (2016). This paper sets out a calculation methodology to determine the greenhouse gas emissions associated with district heat networks which use gas fired CHP as a heat source.

Currently, Part L calculations and CHP emissions savings are based on the grid based emission rate taken from the SAP 2012 3-year average - 519g/KwhCO2; SAP 2012 introduced a 15-year average at 381g/KwhCO2 to assist designers considering the longer term impacts.

Such a difference will markedly affect the relative calculated performance of a gas CHP engine versus a heat only gas boiler.



The CIBSE paper further advises that "Using a typical good practice assumption of 40% thermal efficiency of the CHP, the threshold for net benefit is a grid carbon factor of around 338 gCO2/kWh. Below that threshold, CHP is found to be worse than a gas boiler and grid electricity."

DECC provides data for treating energy and emissions in their guidance; this provides projections of grid emissions factors over the next 85 years. With the rapid and recent introduction of renewable technologies to the grid – wind power and PV - DECC's "Green Book" guidance projects that grid carbon intensity will reach 338 gCO2/kWh by 2017/18 and will reach $300\text{gCO}_2\text{kWh}$ by 2018/19.

SAP10 data, be utilised within this report, uses a figure of 233 gCO₂/kWh.

So it can be surmised, that by the time an CHP led boiler system at 140 Fortis Green has reached maturity over the next couple of years, the carbon benefits will already have been lost.

However, this report must also consider the potential for heat only boilers to drive a community heating system; in more recent times, the difference between the actual and assumed efficiency of DH networks has come under the spotlight from a number of different sources.

Indeed, in a recent studies collated by Innovate UK in the Building Data Exchange, inappropriately installed community heating systems were suffering heat losses of 50% or more.

However, when it comes to small scale networks as least, it is becoming very apparent that there is a difference between theoretical and real-world system efficiencies.

In the CBSE Technical symposium "CHP and District Heating - how efficient are these technologies?" (2011), further commentary is made on this issue.

This paper defines an 'equivalent heat efficiency' parameter and a CO₂ content of heat supply to enable Combined Heat and Power (CHP) to be compared to boilers and heat pumps

This report identifies and acknowledge that the heat losses within a well-designed DH network will be at minimum of 15%, so immediately it can be seen that, a large scale modular boiler system offering gross efficiencies at circa 96%, will be less efficient than a local condensing boiler with a gross efficiency of 92%-93% at point of delivery.

It can be summarised, an a small scale 8 unit scheme with no future DEN potential connection, the installation of a centralised LTHW system would be counter-productive.



6.0 Renewable Energy Options

The final element of the Mayor's 'Energy Hierarchy' requires development proposals should provide a reduction in expected carbon dioxide emissions through the use of onsite renewable energy generation, where feasible – Be Green.

Renewable energy can be defined as energy taken from naturally occurring or renewable sources, such as sunlight, wind, wave's tides, geothermal etc. Harnessing these energy sources can involve a direct use of natural energy, such as solar water heating panels, or it can be a more indirect process, such as the use of Biofuels produced from plants, which have harnessed and embodied the suns energy through photosynthesis.

The energy efficiency measures and the sourcing the energy efficiently outlined above have the most significant impact on the heating and hot water energy requirements for the development, and the associated reduction in gas consumption.

This section then sets out the feasibility of implementing different energy technologies in consideration of: -

- Potential for Carbon savings
- Capital costs
- Running costs
- Payback period as a result of energy saved/Government incentives
- Maturity/availability of technology
- Reliability of the technology and need for back up or alternative systems.

6.1 Government incentives

6.1.1 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was formally withdrawn to non-domestic applications (i.e. developer lead applications) in March 2021.

6.2 Wind turbines

Wind turbines come in two main types'- horizontal axis and vertical axis. The more traditional horizontal axis systems rotate around the central pivot to face into the wind, whilst vertical axis systems work with wind from all directions.

The potential application of wind energy technologies at a particular site is dependent upon a variety of factors. But mainly these are: -

- Wind speed
- Wind turbulence
- Visual impact
- Noise impact
- Impact upon ecology



The availability and consistency of wind in urban environments is largely dependent upon the proximity, scale and orientation of surrounding obstructions. The site is flanked by other properties at 3 stories in all directions. To overcome these obstructions and to receive practical amounts of non-turbulent wind, the blades of a wind turbine would need to be placed significantly above the roof level of the surrounding buildings and the proposed project at Best Court itself.

It is inconceivable that any wind turbines of this size would be considered acceptable in this location.

6.3 Solar Energy

The proposed development has areas of low pitched roof that could accommodate solar panels orientated to the south.

In general, the roofs will have an unrestricted aspect, so there is scope therefore to site solar photovoltaic (PV) or water heating equipment at roof level.

6.3.1 Solar water heating

Solar water heating panels come in two main types; flat plate collectors and evacuated tubes. Flat plate collectors feed water, or other types of fluid used specifically to carry heat, through a roof mounted collector and into a hot water storage tank. Evacuated tube collectors are slightly more advanced as they employ sealed vacuum tubes, which capture and harness the heat more effectively.

Both collector types can capture heat whether the sky is overcast or clear. Depending on location, approximately 900-1100 kWh of solar energy falls on each m^2 of unshaded UK roof surface annually. The usable energy output per m^2 of solar panel as a result of this amount of insolation ranges from between 380 - 550 kWh/yr.

Solar hot water systems are of course, displacing gas for DHW provision (as noted above), and due to the low cost of gas as a source of energy, solar thermal systems tend to have a very poor pay back model unless there is a reliable and consultant demand for hot water; a medium size residential scheme simply does not provide this

Accordingly, given the limited roof space available and the strategy to off-set the electrical use, solar PV may be a stronger candidate (see below) and offer a greater return in terms of a return on investment.

6.3.2 Photovoltaics (PV)

A 1kWp (1 kilowatt peak) system in the UK could be expected to produce between 790-800kWh of electricity per year based upon a south east orientation according to SAP2005 methodology used by the Microgeneration Certification Scheme (MCS). The figure given in the London Renewables Toolkit is 783 kWh per year for a development in London.



Despite the withdrawal of the Feed in Tariff, the returns on PV installations can still achieve levels at 3-4% via the reduction in electricity consumption – becoming more significant as electricity costs rise.

Accordingly, the design team are proposing the use of an 32 panels array located on the south west facing pitched roofs; 4 panels per dwelling - a total array at 10.56Kwp, producing some 8,694.56Kwh/annum.

6.4 Biomass heating

Biomass is a term given to fuel derived directly from biological sources for example rapeseed oil, wood chip/pellets or gas from anaerobic digestion. It can only be considered as a renewable energy source if the carbon dioxide emitted from burning the fuel is later recaptured in reproducing the fuel source (i.e. trees that are grown to become wood fuel, capture carbon as they grow).

Biomass heating systems require space to site a boiler and fuel hopper along with a supply of fuel – which can be very bulky items. There also needs to be a local source of biomass fuel that can be delivered on a regular basis. There are also issues with fuel storage and delivery which mitigate against this technology. There is inadequate space at ground floor level for a fuel store and limited access for delivery lorries.

Additionally, a boiler of this type would replace the need for a conventional gas boiler and therefore offset all the gas energy typically used for space and water heating. However, biomass releases high levels of NO_x emissions and particulate matters, as well as other pollutants and would therefore have to be considered carefully against the high standard of air quality requirements in and around Newham's Borough main road AQMAs. Accordingly, the use of biomass is not considered appropriate for this project.

6.6 Ground source heat pump

All heat pump technologies utilise electricity as the primary fuel source – in this case displacing gas, as such, the overall reduction in emissions when using this technology can be less effective when opposed to a technology that is actually displacing electricity.

Ground source heating or cooling requires a source of consistent ground temperature, which could be a vertical borehole or a spread of pipework loops and a 'heat pump'. The system uses a loop of fluid to collect the more constant temperature in the ground and transport it to a heat pump. In a cooling system this principle works in reverse and the heat is distributed into the ground.

The heat pump then generates increased temperatures by 'condensing' the heat taken from the ground, producing hot water temperatures in the region of 45°C. This water can then be used as pre-heated water for a conventional boiler or to provide space heating with an under-floor heating system.



The use of a ground source heating/cooling system will therefore require:

- Vertical borehole or ground loop
- Use of under floor heating
- Space for heat pump unit

Clearly, there is insufficient land area to install low level collector loops, leaving deep bore GSHP as the only potential option.

Normally the boreholes would need to be 6 to 8 metres apart and a 100-metre-deep borehole will only provide about 5kw of heat. The borehole should also be formed around 3m away from the perimeter of the building and most specialists don't recommend using the structural boreholes.

Clearly, in the case of the proposed development, there is little scope for the locating of the ground collector devices and as such, ground source heating cannot be considered.

6.7 Air source heat pump

Air source heating or cooling also employs the principle of a heat pump. This time either, upgrading the ambient external air temperature to provide higher temperatures for water and space heating, or taking warmth from within the building and dissipating it to the outdoor air.

It must be remembered that heat pumps utilise grid based electricity, so calculations base the benefits on SAP10 emissions data

Assuming a seasonal system efficiency of 320% (Coefficient of Performance of 3.2) and that the air source heat pump will replace 100% of the space heating/hot water demand, then the system would reduce the overall CO₂ emissions by approximately 60%. The table below demonstrates, on the assumption of a demand of 1000Kwh/year for heating and hot water.

Table 4 - ASHP Performance

Type of Array	Energy Consumption (Kwh/yr.)	Emission factor (kgCO₂/Kwh)	Total CO₂ emissions (kg/annum)
90% efficient gas boiler	11111	0.210	2333
320% efficient ASHP	2813	0.233	655
100% efficient immersion (back-up)	1000	0.233	233

A theoretical carbon saving of 60%

Accordingly, the design team are proposing the use of air source heat pump systems located in specific plant areas adjacent to each dwelling to service the heating requirements for the houses via internally mounted hydro-box units – providing heating and hot water.



6.8 Final Emissions Calculation

Given the outcome of the feasibility study above, the developer is proposing the use the above noted air source heat pump system for the heating and DHW requirements and a roof mounted PV array

The final table – Table 5 – summarises the final outputs from the SAP models; attached at **Appendix C.**

Table 5 – "Be Green" emission levels

Unit	Emission Rate	Unregulated	Total baseline	Total baseline
	(regulated	Energy Use	emissions	emissions
	energy use)			
	Kg/sqm	Kg/sqm	Kg/sqm	Kg
Sample 1	4.70	6.82	11.52	1038.04
Sample 2	4.50	6.82	11.36	1023.53
Sample 3	4.70	6.82	11.52	1038.04
Development				8258
Total				0230

The data at Table 5 confirms that overall emissions – including unregulated energy use - have been reduced by **50.62%** over and above the baseline model, with a **45.96%** reduction in emissions directly from the use of energy generating and renewable technologies, i.e. over and above the energy efficient model.

Excluding the un-regulated use, i.e. considering emissions controlled under AD Part L, then the final reduction in DER/TER equates to **71.65%.**



7.0 Sustainable Design & Construction

The Sustainability credentials of the proposed residential development are set out below; based on the assessment criteria developed by the Building Research Establishment

Materials

New build construction techniques will be considered against the BRE Green Guide to ensure that, where practical, the most environmentally friendly construction techniques are deployed.

Construction materials will be sourced from suppliers capable of demonstrating a culture of responsible sourcing via environmental management certification, such as BES6001

Insulation materials will be selected that demonstrate the use of blowing agents with a low global warming potential, specifically, a rating of 5 or less. Additionally, all insulants used will demonstrate responsible sourcing of material and key processes.

The principle contractor with be required to produce a site waste management plan and sustainable procure plan, in line with BREEAM requirements – this will include a predemolition audit to identify demolition materials to reuse on-site or salvage appropriate materials to enable their reuse or recycling off-site. The procurement plan will follow the waste hierarchy Reduce; Reuse & Recycle.

A Site Waste Management Plan (SWMP) will be developed prior to commencement of development stage to inform the adoption of good practice waste minimisation in design. This will set targets to minimise the generation of non-hazardous construction waste using the sustainable procurement plan to avoid over-ordering and to use just-in-time delivery policies.

Operational waste and recycling – appropriate internal and external storage space will be provided to ensure that residents can sort, store and dispose of waste and recyclable materials in line with Greenwich's collection policies.

Pollution

The contractor will also monitor the use of energy and water use during the construction phase and incorporate best site practices to reduce the potential for air (dust) and ground water pollution.

The completed dwellings will use zero emission heat pump systems for heating and hot water.

The main contractor will be required to register the site with the Considerate Constructors Scheme and achieve a best practice score of 25 or more.



To void the issue of noise pollution, the development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings.

Energy

The dwelling will incorporate renewables technologies as noted in the main report above.

The new homes will also be supplied with a Home User Guide offering practical advice on how to use the home economically and efficiently, including specific advise on how to reduce unregulated energy uses.

This will be further enhanced by the installation of smart energy metering, enabling occupants to accurately assess their energy usage and thereby, manage it; specifically aligning with local plan policy SC2.

Water

The development minimise water use as far as practicable by incorporating appropriate water efficiency and water recycling measures. The applicants will ensure that all dwellings meet the required level of 105 litres maximum daily allowable usage per person in accordance with Level 4 of the Code for Sustainable Homes.

A sample Part G internal water use calculation is attached at **Appendix E**.

Sustainable Urban Drainage (SuDs)

The existing site is currently made up entirely of building and hard surfaces. Accordingly, the introduction of new planted areas and green roof areas will help to reduce the levels of surface water run-off.

A formal flood risk assessment and SuDs strategy is submitted under separate cover

Ecology and Biodiversity

Clearly, the existing site is 100% previously developed - building and car parking areas - so any improvement on this situation would increase biodiversity.

The development will offer private amenity space capable of being planted, and owners will be encouraged to install bird boxes.



8.0 Conclusions

This report has detailed the baseline energy requirements for the proposed development, the reduction in energy demand as a result of energy efficiency measures and the potential to achieve further CO₂ reductions using renewable energy technologies.

The baseline results have shown that if the development was built to a standard to meet only the minimum requirements of current building regulations, the total amount of CO_2 emissions would be **16725Kg/year**.

Following the introduction of passive energy efficiency measures into the development, as detailed in section 4, the total amount of CO₂ emissions would be reduced to **15280Kg/year.**

There is also a requirement to reduce CO₂ emissions across the development using renewable or low-carbon energy sources. Therefore, the report has considered the feasibility of the following technologies:

- Wind turbines
- Solar hot water
- Photovoltaic systems
- Biomass heating
- CHP (Combined heat and power)
- Ground & Air source heating

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that the most suitable solution to meeting reduction in CO₂ emissions would be the use of heat pump technology for the generation of heating and hot water for the project, alongside a roof mounted 10.56kwp PV array.

This has been used in the SAP models (reproduced at **Appendix C**) for the development which have also been detailed above in Table 5, which show a final gross emission level of **8258Kg/year**, representing a total reduction in emission over the baseline model, taking into account unregulated energy, of **50.62%**.

In addition, the final SAP outputs at **Appendix C** demonstrate that the building achieves an overall improvement in regulated emissions over the Building Regulations Part L standards for regulated emissions of minimum of **71.65%**.

Finally, taking into account the calculated carbon emissions associated with the demolition and construction process under **section 3.3** (above) and adding this to the baseline operational emissions, a total of **43.32t**, then the operational reduction at **8.47t** represents an overall **19.55%**, in line with best practice for non-major schemes.



Accordingly, it has been demonstrated that the impacts of demolition and construction works can be fully offset.

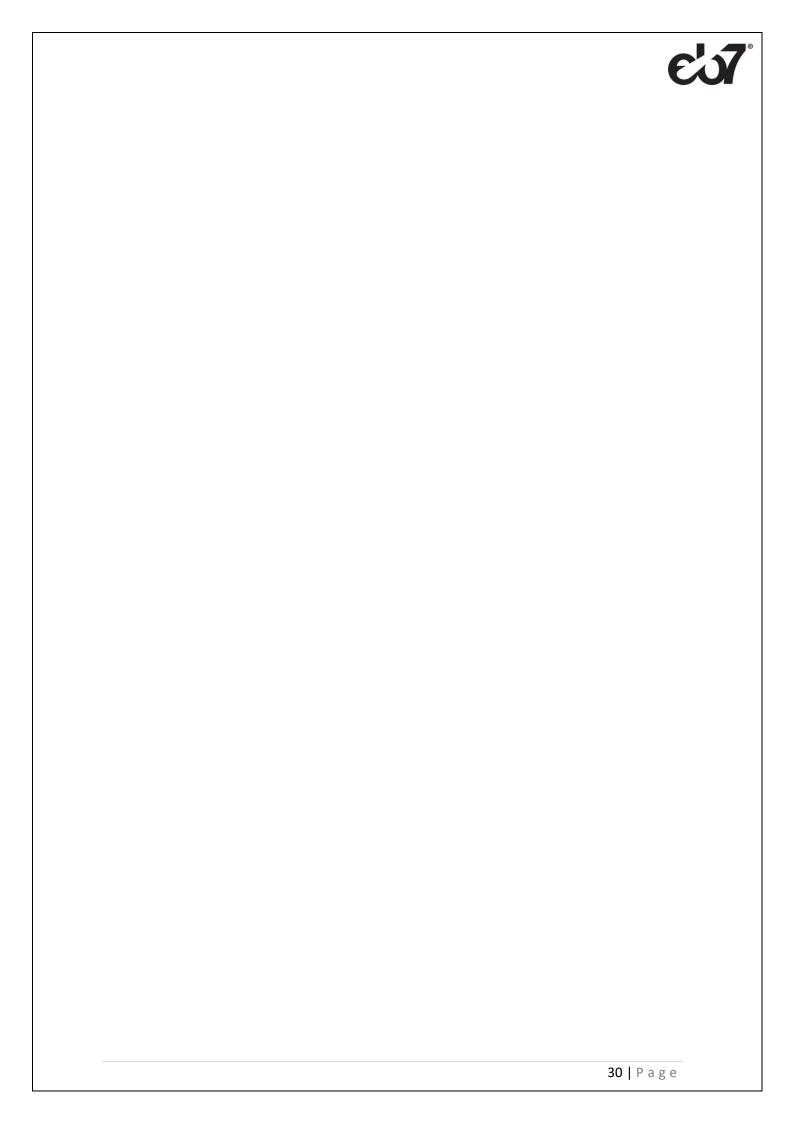
Tables 6 & 7 Demonstrate how the Best Court project complies with the London Plan requirements and the GLA guidance relating to zero carbon development.

Table 6 – Carbon Emission Reductions – Domestic Buildings

Key	Tonnes/annum
Baseline CO ₂ emissions (Part L 2013 of the Building Regulations Compliant Development)	11.82
CO2 emissions after energy demand reduction (be lean)	10.37
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean)	0.00
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean) AND renewable energy (be green)	3.35

Table 7 – Regulated Emissions Savings – domestic Buildings

	Regulated Carbo	n Dioxide Savings
	(Tonnes CO2 per annum)	%
Savings from energy	1.45	12.28
demand reduction		
Savings from heat network	0.00	0.00
C	7.00	50.30
Savings from renewable	7.02	59.39
energy Total Cumulative Savings	8.47	71.66
Total Cultivative Savings	0.47	71.00
	(Tonne	es CO ₂)
Carbon Shortfall	3.	35
Cumulative savings for off-	10	0.5
set payment		
Cash-in-lieu Contribution	£N	I/A





Appendix A

Baseline/Un-regulated Energy Use:-

SAP Outputs & Target Emission Rates

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:55:17

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -BASE

Plot Reference: Sample 1

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.63 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.53 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²

ОК

2 Fabric U-values

Element Highest **Average** External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 %

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

OK

Regulations Compliance Report

6 Controls

Space heating controls TTZC by plumbing and electrical services

OK No cylinder thermostat

No cylinder

OK Boiler interlock: Yes

7 Low energy lights

Hot water controls:

Percentage of fixed lights with low-energy fittings 100.0% 75.0% OK Minimum

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Slight Overheating risk (Thames valley):

Based on:

Overshading: Average or unknown

Windows facing: North West 7.55m² Windows facing: South East $8.19m^{2}$ 0.55m² Windows facing: South West 1.01m² Roof windows facing: North West Ventilation rate: 4.00

10 Key features

Roofs U-value 0.12 W/m²K 0 W/m²K Party Walls U-value

OK

TER WorkSheet: New dwelling design stage

		User	Details:						
Assessor Name:	Neil Ingham		Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 2012			are Vei			Versio	n: 1.0.5.41	
A 11		Property	Address	: Sample	e 1				
Address: 1. Overall dwelling dimer	nsions:								
1. Overall awelling alline	noione.	Are	ea(m²)		Av. He	ight(m)		Volume(m³)	
Ground floor			33.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			33.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor			23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	(1n)	90.08	(4)			_		_
Dwelling volume				(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:									
	main sec heating hea	ondary ating	other		total			m³ per houi	r
Number of chimneys	0 +	0 +	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0		0	x	20 =	0	(6b)
Number of intermittent far	ns				3	x	10 =	30	(7a)
Number of passive vents				Ē	0	x	10 =	0	(7b)
Number of flueless gas fir	res			F	0	x -	40 =	0	(7c)
				_					
				_				anges per ho	_
Infiltration due to chimney	vs, flues and fans = (6a)+ een carried out or is intended,			continue fr	30		÷ (5) =	0.13	(8)
Number of storeys in th		proceed to (17)	otrier wise (Jonanue III	om (9) to (10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber fra	me or 0.35 f	or mason	ry constr	ruction			0	(11)
if both types of wall are pro deducting areas of opening	esent, use the value correspor	nding to the grea	ater wall are	a (after					_
	oor, enter 0.2 (unsealed	l) or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2	? x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic	metres per h	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	•							0.38	(18)
Air permeability value applies Number of sides sheltered	s if a pressurisation test has be	een done or a d	egree air pe	rmeability	is being us	sed	ı		7(10)
Shelter factor	u		(20) = 1 -	[0.075 x (1	19)] =			0 1	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18) x (20) =				0.38	(21)
Infiltration rate modified for	-								
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		

TER WorkSheet: New dwelling design stage

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	ing for sh	nelter an	d wind s	speed) =	= (21a) x	(22a)m					
0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45		
Calculate effect		•	rate for t	he appli	cable ca	se		-		-		0	(23a)
If exhaust air he			endix N, (2	23b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)			0	(23a)
If balanced with									, , ,			0	(23c)
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MV	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)		(2 2)
(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 red	covery (MV) (24b)m = (2	2b)m + (23b)	•	•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	e input	ventilati	on from o	outside		-			
if (22b)m		` 	<u> </u>	´`			í `	ŕ	.5 × (23b	ŕ –		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural v							on from I 0.5 + [(2		0.51				
(24d)m = 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	1	(24d)
Effective air		rate - er	iter (24a		o) or (24	c) or (24		(25)				J	
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]	(25)
2 Hoot lease	o and he	at loss i							•			ı	
3. Heat losses	s and he												
					Net Ar	rea	U-valı	ıe	AXU		k-value	<u>a</u>	ΑΧk
ELEMENT	Gros area	SS	oaramet Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²·l		A X k kJ/K
	Gros	SS	Openin	ıgs		m²			_	K)			
ELEMENT	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
ELEMENT Doors	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	eK = 0.04] =	(W/	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area e 1	SS	Openin	ıgs	A ,r 2.28 7.55	m² x x x x x x	W/m2 1 1/[1/(1.4)+	0.04] =	(W/ 2.28 10.01	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1	SS	Openin	ıgs	A ,r 2.28 7.55 8.19	m² x x x x x x x x x x x x x x x x x x x	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.28 10.01 10.86	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area e 1	SS	Openin	ıgs	A ,r 2.28 7.55 8.19 0.55	m² x x x x x x x x x x x x x x x x x x x	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W// 2.28 10.01 10.86 0.73				kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights	Gros area e 1	ss (m²)	Openin	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) +	0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.28 10.01 10.86 0.73 1.717				kJ/K (26) (27) (27) (27) (27b)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor	Gros area : 1 : 2 : 3	ss (m²)	Openin n	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342				kJ/K (26) (27) (27) (27) (27b)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	Gros area : 1 : 2 : 3 : 128.6	68 2	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18	0.04] = 0.04] = 0.04] = 0.04] = = = = = =	2.28 10.01 10.86 0.73 1.717 4.3342 19.82				kJ/K (26) (27) (27) (27) (27b) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	Gros area 1 1 2 2 2 3 3 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	68 2 69	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 0.13 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82				kJ/K (26) (27) (27) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1	Gros area 1 1 2 2 2 3 128.6 6.62 25.5	68 2 2 2	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2				kJ/K (26) (27) (27) (27b) (28) (29) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area 1 1 28.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18 0.13	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (29) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3	Gros area 1 1 28.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18 0.13	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type2 Roof Type2 Roof Type3 Total area of e	Gros area 1 1 2 2 2 3 3 128.6 6.62	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48				kJ/K (26) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (31) (32)
Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall	Gros area 1 1 2 2 2 3 3 128.6 6.62	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48				kJ/K (26) (27) (27) (27b) (28) (29) (29) (30) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall Internal wall **	Gros area 1 1 2 2 2 3 3 128.6 6.62	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall Internal wall ** Internal floor	Gros area 1 1 2 2 2 3 3 128.6 6.62 25.5 6.22 3.72 1ements	68 2 2 2 2 , m ²	Openin m 18.5 0 1.01 0 0	ngs 7	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26 95.5 56.74 alue calcul	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13 0.13	eK = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48		kJ/m²·l		kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (31) (32) (32c)

(26)...(30) + (32) =

Fabric heat loss, $W/K = S (A \times U)$

55.32

(33)

TER WorkSheet: New dwelling design stage

	า = S(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	14802.44	(34)
Thermal mass pa	, ,	1P = Cm -	÷ TFA) ir	ı kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assessme	nts where the o	letails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	200	(33)
can be used instead of					,							٦
Thermal bridges	` ,		• .	•	<						11.44	(36)
if details of thermal br Total fabric heat I		(nown (36) :	= 0.05 x (3	1)			(33) +	(36) =			66.75	(37)
Ventilation heat lo	oss calculate	ed monthl	V				(38)m	= 0.33 × (25)m x (5)			
	Feb Mar	ı	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
	5.28 44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer coe	fficient, W/K				<u> </u>	<u>I</u>	(39)m	= (37) + (3	38)m		1	
(39)m= 112.38 1°	12.04 111.7	110.12	109.82	108.45	108.45	108.19	108.98	109.82	110.42	111.05]	
Heat loss parame	eter (HLP) V	V/m²K						Average = = (39)m ÷	` '	12 /12=	110.12	(39)
	1.24 1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.23	1.23	1	
(2)								L Average =			1.22	(40)
Number of days i	n month (Ta	ble 1a)										
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28 31	30	31	30	31	31	30	31	30	31		(41)
4. Water heating	energy req	uirement:								kWh/y	ear:	
Assumed occupa if TFA > 13.9, N											1	(40)
if TFA £ 13.9, N Annual average h	N = 1 not water usa	age in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		9)	.59]	(42)
if TFA £ 13.9, N	N = 1 not water usa verage hot wate	age in litre	es per da 5% if the d	y Vd,av	erage = designed t	(25 x N)	+ 36		9)]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre	N = 1 not water usa verage hot wate es per person p	age in litre er usage by er day (all w	es per da 5% if the d vater use, f	y Vd,avelling is not and con	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9)	.59]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre	N = 1 not water usage hot waters es per person person per Mar	age in litre er usage by er day (all w	es per da 5% if the d vater use, f	y Vd,ave welling is not and con Jun	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre Jan Hot water usage in litre	N = 1 not water usage hot waters es per person person per Mar	age in litre er usage by er day (all w Apr each month	es per da 5% if the d vater use, f	y Vd,ave welling is not and con Jun	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9)	.59]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre Jan Hot water usage in litre	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for	age in litre er usage by er day (all w	es per da 5% if the d vater use, f May Vd,m = fac	y Vd,ave welling is not and con Jun	erage = designed to designed t	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	Oct	9) 96 Nov	.59 Dec 106.25	1159.04	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre Jan Hot water usage in litre	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for 102.38 98.52	age in litre or usage by er day (all w Apr each month	es per da 5% if the d vater use, t May Vd,m = fac 90.79	y Vd,avi welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Su	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litt (44)m= 106.25 10 Energy content of hot	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for 102.38 98.52	age in litre or usage by er day (all w Apr each month	es per da 5% if the d vater use, t May Vd,m = fac 90.79	y Vd,avi welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Su	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litr (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2	age in litre or usage by er day (all w Apr each month 94.66 alculated me 123.97	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Total = Suith (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litr (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2	age in litre or usage by er day (all w Apr each month 94.66 alculated me 123.97	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Total = Suith (see Tail 128.72	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h The state of the annual average in literate of the state of	N = 1 not water usarerage hot water es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2 r heating at poi 0.67 21.33	age in litre or usage by er day (all w Apr each month 94.66 alculated me 123.97	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Total = Suith (see Tail 128.72	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litr (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1 If instantaneous water (46)m= 23.63 2 Water storage loss	N = 1 not water usa verage hot water se per person p Feb Marres per day for 102.38 98.52 water used - c 137.8 142.2 r heating at poin 10.67 21.33	age in litre rusage by er day (all was age) Apr each month 94.66 alculated me 123.97 ant of use (no 18.6	es per da 5% if the d vater use, h May Vd,m = fac 90.79	y Vd,avewelling is not and constant from 186.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 07m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	98.52 Total = Sunth (see Tail 128.72 Total = Sunth 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpretation of the second of the se	N = 1 not water usarerage hot water es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2 r heating at poi 0.67 21.33 ss: litres) includ	age in litre er usage by er day (all w Apr each month 94.66 123.97 nt of use (no	es per da 5% if the d yater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W	y Vd,avi welling is not and col Jun ctor from 7 86.93 190 x Vd,ri 102.65	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	98.52 Total = Sunth (see Tail 128.72 Total = Sunth 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpolation of the term of the ter	N = 1 not water usarerage hot water uses per person p Feb Marres per day for 102.38 98.52 water used - c 37.8 142.2 r heating at poi 10.67 21.33 ss: litres) includiting and no cored hot water uses	age in litre or usage by er day (all was age). Apr each month 94.66 123.97 Int of use (not all use). In the litroid in the l	es per da 5% if the d yater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W yelling, e	y Vd,avi welling is not and col Jun ctor from 1 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average in liter Jan Hot water usage in lite (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1 If instantaneous water (46)m= 23.63 2 Water storage loss Storage volume (If community hear	N = 1 not water user resper day for 2.38 98.52 water used - c 37.8 142.2 r heating at point 1.33 SS: litres) includiting and not cored hot water used ses:	age in litre ar usage by er day (all w Apr each month 94.66 123.97 at of use (no 18.6 ing any setank in dw ter (this in	es per da 5% if the d yater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W yelling, e	y Vd,ave welling is not and contained and co	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpretation of the second of the se	N = 1 not water usarerage hot water uses per person p Feb Marres per day for 102.38 98.52 water used - c 137.8 142.2 r heating at poi 158: litres) includiting and not cored hot water uses 158: er's declared	age in litre or usage by er day (all was each month) 94.66 123.97 nt of use (note that is in dwas each in dwas each in dwas each each each each each each each each	es per da 5% if the d yater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W yelling, e	y Vd,ave welling is not and contained and co	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) 96 Nov 102.38 m(44) ₁₁₂ = 10bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpolation of the term of the ter	N = 1 not water use verage hot water uses per person p Feb Marres per day for 102.38 98.52 water used - c 137.8 142.2 r heating at point 10.67 21.33 is: litres) includiting and not cored hot water uses or from Table 10.67	age in litre or usage by er day (all was age by er day (all was age by er day (all was age) and a look alculated more alculate	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W welling, e ncludes in	y Vd,ave welling is not and contained and co	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)

													(51)	
If community heating see section 4.3 Volume factor from Table 2a													1	
				2h							-	0		(52)
•	erature fa							(47) (54)	· · · (FO) · · · (E0\		0		(53)
	/ lost froi (50) or (_	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =	-	0		(54) (55)
	. , .	, ,	,	for each	month			((56)m = (55) × (41)	m		U		(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ (56)m = 0 0 0 0 0 0 0 0 0 0 0 0													1	(50)
	or contains	-		_	_	_	-	_	_		-	•	liv H	(56)
-		1											1	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	y circuit	•	•									0		(58)
	y circuit				,	,	,	` ,		r tharma	otot\			
(11100 (59)m=	dified by	0	0111111	0	nere is s	olar wal	er neau	ng and a	cylinde 0	T thermo	0	0		(59)
									0			0		(00)
	loss cal					<u> </u>	<u> </u>			T			1	(2.1)
(61)m=	50.96	46.03	50.2	46.68	46.27	42.87	44.3	46.27	46.68	50.2	49.32	50.96		(61)
								<u> </u>		ì '	` ´ 	`	(59)m + (61)m	
(62)m=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		(62)
	HW input c									r contribut	ion to wate	er heating)		
•	dditional										1		1	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
•	. 110111 WC												Ī	
(64)m=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		1
(64)m=	208.52	183.83	192.4					Outp	out from w	ater heate	I r (annual)₁	12	2090.41	(64)
(64)m=	208.52	183.83 n water	192.4	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	Outr + (61)m	out from w	ater heater	r (annual)₁ + (57)m	+ (59)m		_
(64)m= Heat g (65)m=	208.52 ains fron 65.13	183.83 n water 57.33	192.4 heating, 59.83	kWh/mo	onth 0.2	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	(64) (65)
(64)m= Heat g (65)m=	208.52	183.83 n water 57.33	192.4 heating, 59.83	kWh/mo	onth 0.2	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu	208.52 ains fron 65.13	183.83 n water 57.33 n in cald	192.4 heating, 59.83 culation of	kWh/mo 52.89 of (65)m	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	208.52 ains fron 65.13 ade (57)n	n water 57.33 n in calc ins (see	heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	208.52 ains from 65.13 ade (57)n ternal ga	n water 57.33 n in calc ins (see	heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	ains from 65.13 de (57)n ernal ga	n water 57.33 n in calc ins (see	heating, 59.83 culation of Table 5	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.29 51.12 only if c	5 ´ [0.85 44.85 ylinder is	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling	out from w 1] + 0.8 x 48.4 or hot w	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05	+ (59)m 63.48 munity h]	_
(64)m= Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ade (57)n ernal ga olic gains	183.83 n water 57.33 n in calco ins (see s (Table Feb 131.34	heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.2: 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05 com com	+ (59)m 63.48 munity h]	(65)
(64)m= Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34	183.83 n water 57.33 n in calco ins (see s (Table Feb 131.34	heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.2: 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05 com com	+ (59)m 63.48 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (n water 57.33 n in calcoins (see S (Table Feb 131.34 (calcular 19.14	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heater x [(46)m 55.35 rater is fr Oct 131.34	+ (57)m 59.05 com com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	208.52 ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55	n water 57.33 n in calcoins (see S (Table Feb 131.34 (calcular 19.14	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heater x [(46)m 55.35 rater is fr Oct 131.34	+ (57)m 59.05 com com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ains from 65.13 Ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain	183.83 n water 57.33 n in calco ins (see S (Table Feb 131.34 (calculat 19.14 ns (calc 241.71	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 1 11.78 n Appendix 222.13	onth 0.23 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	208.52 ains from 65.13 de (57)n cernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22	183.83 n water 57.33 n in calco ins (see S (Table Feb 131.34 (calculat 19.14 ns (calc 241.71	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 1 11.78 n Appendix 222.13	onth 0.23 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	ains from 65.13 Ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	208.52 ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 and fan	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13 ns gains 3	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m	(annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 a and fan	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcular 36.13 as gains 3	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m	(annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 a and fan 3 s e.g. eva	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcula 36.13 as gains 3 aporatio -105.07	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5 3 n (negat	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3 tive value	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 3 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m 55.35 rater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77 212.87 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 and fan 3 s e.g. eva -105.07	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcula 36.13 as gains 3 aporatio -105.07	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5 3 n (negat	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3 tive value	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 3 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m 55.35 rater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77 212.87 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal	gains =	1			(6	6)m + (67)n	n + (68	3)m + (69)m	1 + (70)m +	· (71)m + (72	2)m	_	
(73)m= 413.71	411.55	396.84	372.78	348.24	324.6	309.8	316	.66 329.3	353.6	381.06	401.53		(73)
6. Solar gains	s:												
Solar gains are		•	r flux from	Table 6a		•	ations	to convert to	o the appli		ation.		
Orientation: /	Access F Fable 6d		Area m²			lux able 6a		g_ Table (3h	FF Table 6c		Gains (W)	
-	i able ou		- '''			able da	, ,	Table	JD	Table oc		((v v)	_
Southeast 0.9x	0.77	X	8.	19	X	36.79	X	0.63	X	0.7	=	92.09	(77)
Southeast 0.9x	0.77	X	8.	19	X	62.67	X	0.63	X	0.7	=	156.87	(77)
Southeast 0.9x	0.77	X	8.	19	X	85.75	X	0.63	X	0.7	=	214.64	(77)
Southeast 0.9x	0.77	X	8.	19	X	106.25	X	0.63	X	0.7	=	265.94	(77)
Southeast 0.9x	0.77	X	8.	19	X	119.01	X	0.63	X	0.7	=	297.88	(77)
Southeast 0.9x	0.77	X	8.	19	x	118.15	X	0.63	X	0.7	=	295.73	(77)
Southeast 0.9x	0.77	X	8.	19	x	113.91	X	0.63	X	0.7	=	285.11	(77)
Southeast 0.9x	0.77	X	8.	19	x	104.39	X	0.63	X	0.7	=	261.29	(77)
Southeast 0.9x	0.77	X	8.	19	X	92.85	X	0.63	X	0.7	=	232.41	(77)
Southeast 0.9x	0.77	X	8.	19	x	69.27	X	0.63	Х	0.7	=	173.37	(77)
Southeast 0.9x	0.77	X	8.	19	X	44.07	X	0.63	X	0.7	=	110.31	(77)
Southeast 0.9x	0.77	X	8.	19	X	31.49	x	0.63	X	0.7	=	78.81	(77)
Southwest _{0.9x}	0.77	X	0.5	55	X	36.79		0.63	X	0.7	=	6.18	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	62.67]	0.63	X	0.7	=	10.53	(79)
Southwest _{0.9x}	0.77	Х	0.8	55	x	85.75]	0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	106.25		0.63	X	0.7	=	17.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	119.01		0.63	X	0.7	=	20	(79)
Southwesto.9x	0.77	X	0.8	55	x	118.15		0.63	X	0.7	=	19.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	113.91]	0.63	Х	0.7	=	19.15	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	104.39		0.63	X	0.7	=	17.55	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	92.85		0.63	X	0.7	=	15.61	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	69.27		0.63	X	0.7	=	11.64	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	44.07		0.63	X	0.7	=	7.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	31.49		0.63	X	0.7	=	5.29	(79)
Northwest 0.9x	0.77	X	7.5	55	X	11.28	x	0.63	X	0.7	=	26.03	(81)
Northwest 0.9x	0.77	X	7.5	55	x	22.97	х	0.63	x	0.7	=	52.99	(81)
Northwest 0.9x	0.77	X	7.5	55	x	41.38	x	0.63	X	0.7	=	95.48	(81)
Northwest 0.9x	0.77	X	7.5	55	x	67.96	x	0.63	x	0.7	=	156.8	(81)
Northwest 0.9x	0.77	X	7.5	55	X	91.35	x	0.63	x	0.7	=	210.77	(81)
Northwest 0.9x	0.77	X	7.5	55	x	97.38	x	0.63	x	0.7	=	224.7	(81)
Northwest 0.9x	0.77	x	7.5	55	x	91.1	x	0.63	x	0.7		210.2	(81)
Northwest 0.9x	0.77	X	7.5		x	72.63	X	0.63	x	0.7		167.58	(81)
Northwest 0.9x	0.77	x	7.5		x	50.42] x	0.63	x	0.7		116.34	(81)
Northwest 0.9x	0.77	X	7.5		x	28.07	X	0.63	==	0.7	= =	64.76	(81)
5.5X	0.11	^				_0.07	J '	0.00	^	L 0.7		L 37.70	(-,

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x [0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x [0.63	x [0.7	=	21.26	(81)
Rooflights _{0.9x}	1	X	1.0)1	x	16.37] x [0.63	x [0.7		6.56	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	33.68	x [0.63	x	0.7	=	13.5	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	62.13	x [0.63	x	0.7		24.91	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	104.87	×	0.63	x	0.7	=	42.04	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	143.66	×	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	X	1.0)1	x	154.33	×	0.63	x	0.7		61.87	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	143.9	×	0.63	x	0.7	=	57.69	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	113.05	×	0.63	x	0.7		45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	x	0.63	x	0.7		30.69	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	41.49	x	0.63	×	0.7		16.63	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	20.65	x	0.63	×	0.7		8.28	(82)
Rooflights 0.9x	1	X	1.0)1	x	13.34	x	0.63	×	0.7		5.35	(82)
_							_						
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 130.87	233.9	349.43	482.64	586.24	602.16	572.15	491.	73 395.04	266.41	158.75	110.71		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	ı , watts						•	
(84)m= 544.59	645.45	746.27	855.42	934.48	926.81	881.95	808.3	39 724.42	620.07	539.81	512.25		(84)
7. Mean inter	nal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ole 9.	Th1 (°C)				21	(85)
					-		,	()					` ′
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	_		,	(3)					``
Utilisation fac	ctor for g	ains for l Mar	iving are Apr	ea, h1,m May	_		Au		Oct	Nov	Dec		``
					(see T	able 9a)	1	g Sep	Oct 0.97	Nov 1	Dec 1		(86)
(86)m= 1	Feb 0.99	Mar 0.99	Apr 0.95	May 0.86	Jun 0.69	Jul 0.53	Au 0.59	g Sep 0 0.84		+			
Jan	Feb 0.99	Mar 0.99	Apr 0.95	May 0.86	Jun 0.69	Jul 0.53	Au 0.59	g Sep 0 0.84 able 9c)		+			
(86)m= 1 Mean interna (87)m= 19.63	Feb 0.99 Il temper 19.81	Mar 0.99 ature in 1 20.09	Apr 0.95 living are 20.47	May 0.86 ea T1 (fo 20.78	(see T Jun 0.69 ollow st 20.95	Jul 0.53 eps 3 to 7 20.99	0.59 7 in Ta 20.9	g Sep 0.84 able 9c) 8 20.85	0.97	1	1		(86)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature	Feb 0.99 Il temper 19.81	Mar 0.99 ature in 1 20.09	Apr 0.95 living are 20.47	May 0.86 ea T1 (fo 20.78	Jun 0.69 bllow st 20.95 dwellin	Jul 0.53 eps 3 to 7 20.99	0.59 7 in Ta 20.9	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C)	0.97	1	1		(86)
Jan (86)m= 1	Feb 0.99 Il temper 19.81 during h	Mar 0.99 ature in l 20.09 neating p	Apr 0.95 living are 20.47 eriods ir	May 0.86 ea T1 (fo 20.78 n rest of 19.9	Jun 0.69 Ollow st 20.95 dwellin 19.92	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92	Au 0.597 in Ta 20.99 able 9	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C)	0.97	19.97	19.61		(86)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r	Apr 0.95 living are 20.47 eriods ir 19.9	May 0.86 ea T1 (for 20.78 rest of 19.9 welling,	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table	Au 0.59 7 in Ta 20.9 able 9 19.9	g Sep 0 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91	0.97 20.45 19.9	19.97	19.61		(86) (87) (88)
Jan (86)m= 1	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4	Au 0.597 in Ta 20.99 able 9 19.9 9a) 0.46	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91	0.97 20.45 19.9	19.97	19.61		(86)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.81 during h 19.89 etor for gas 0.99 Il temper	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do 0.94 the rest	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelli	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4	Au 0.597 in Ta 20.99 able 9 19.9 9a) 0.46	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 6 0.77 to 7 in Table	0.97 20.45 19.9 0.96 e 9c)	1 19.97 19.9 0.99	1 19.61 19.89		(86) (87) (88) (89)
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Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99 Il temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling	(see T Jun 0.69 b) llow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (gable 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 (follow steens)	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 6 0.77 to 7 in Tabl 1 19.8	0.97 20.45 19.9 0.96 e 9c) 19.26	19.97 19.9 0.99	1 19.61 19.89 1	0.27	(86) (87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99 Il temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling	(see T Jun 0.69 b) llow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (gable 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 (follow steens)	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3	g Sep 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 to 7 in Table 1 19.8 f -fLA) × T2	0.97 20.45 19.9 0.96 e 9c) 19.26	19.97 19.9 0.99	1 19.61 19.89 1	0.27	(86) (87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07	Feb 0.99 al temper 19.81 during h 19.89 etor for ga 0.99 al temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74 ature (fo	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28 r the wh	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling 19.69 ole dwe 19.99	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (19.88 llling) = 20.17	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 follow ste 19.91 fLA × T1 20.21	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3 19.9 + (1 - 20.2	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 6 0.77 to 7 in Tabl 1 19.8 f -fLA) × T2 2 20.08	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi	1 19.97 19.9 0.99 18.58 ng area ÷ (4	1 19.61 19.89 1 18.04 4) =	0.27	(86) (87) (88) (89) (90) (91)
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Useful gains, hmGm , W = (94)m x (84)m		(0-1)
	510.63	(95)
Monthly average external temperature from Table 8 (96)m=	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	4.2	(30)
	1584.49	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		(- /
	798.95	
Total per year (kWh/year) = Sum(98) ₁ .	15,912 = 3935.8	(98)
Space heating requirement in kWh/m²/year	43.69	(99)
	43.09	(00)
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		(206)
	93.4	
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) 783.47 611.65 505.97 276.06 109.51 0 0 0 292.68 557.51 7	709.05	
	798.95	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	055.44	(211)
838.83 654.88 541.73 295.56 117.25 0 0 0 0 313.36 596.91 8 Total (kWh/year) = Sum(211) _{15.1012} =	855.41	(244)
	4213.92	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	
Total (kWh/year) =Sum(215) _{15,1012} =	0	(215)
Water heating		()
Output from water heater (calculated above)		
	203.55	
Efficiency of water heater	80.3	(216)
(217)m= 88.07 87.85 87.37 86.26 84.04 80.3 80.3 80.3 80.3 86.28 87.6 8	88.15	(217)
Fuel for water heating, kWh/month		
(219) m = (64) m x $100 \div (217)$ m (219) m= 236.76 209.26 220.21 197.85 196.59 181.22 173.62 193.55 195.68 207.37 216.69 2	230.91	
(219)m= 236.76 209.26 220.21 197.85 196.59 181.22 173.62 193.55 195.68 207.37 216.69 2 Total = Sum(219a), 12 =		(040)
	2459.72	(219)
Annual totals Space heating fuel used, main system 1	kWh/ye 4213.92	ar
Water heating fuel used	2459.72	
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)

boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	75	(231)
Electricity for lighting			380.53	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =		7129.17	(338)
12a. CO2 emissions – Individual heating system	s including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	910.21	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216	531.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =		1441.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	197.49	(268)
Total CO2, kg/year	sum	of (265)(271) =	1677.93	(272)

TER =

18.63

(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:55:16

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Mid-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -BASE

Plot Reference: Sample 2

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.63 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.62 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.8 kWh/m²

ОК

2 Fabric U-values

Element Highest **Average** External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 %

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

OK

Regulations Compliance Report

6 Controls

Space heating controls TTZC by plumbing and electrical services

No cylinder thermostat

No cylinder

Boiler interlock: Yes OK

7 Low energy lights

Hot water controls:

Percentage of fixed lights with low-energy fittings 100.0%

Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Medium

Based on:

Overshading: Average or unknown

Windows facing: North West
7.55m²
Windows facing: South East
8.19m²
Windows facing: South West
Roof windows facing: North West
1.01m²
Ventilation rate:
4.00

10 Key features

Roofs U-value 0.12 W/m²K
Party Walls U-value 0 W/m²K

OK

OK

		User Deta	ils:				
Assessor Name:	Neil Ingham		roma Num	ıber:	STRC	010943	
Software Name:	Stroma FSAP 2012		ftware Ve		Versio	n: 1.0.5.41	
		Property Add	ress: Sample	e 2			
Address :							
1. Overall dwelling dimen	nsions:						
Cround floor		Area(m	<u> </u>	Av. Height(m)	٦,, ,	Volume(m³)	_
Ground floor		33.34	(1a) x	2.4	(2a) =	80.02	(3a)
First floor		33.34	(1b) x	2.7	(2b) =	90.02	(3b)
Second floor		23.4	(1c) x	2.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 90.08	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+	(3n) =	222.92	(5)
2. Ventilation rate:							
	main secon heating heati	dary oth	er	total		m³ per houi	r
Number of chimneys			<u> </u>	0 x	40 =	0	(6a)
Number of open flues	0 + 0	- + -	=	0 x	20 =	0	(6b)
Number of intermittent far	ns			3 ×	10 =	30	(7a)
Number of passive vents			Γ	0 x	10 =	0	(7b)
Number of flueless gas fir	res		Ī	0 x	40 =	0	(7c)
			_				
			_		Air ch	nanges per ho 	ur —
· · · · · · · · · · · · · · · · · · ·	ys, flues and fans = (6a)+(6l		I		÷ (5) =	0.13	(8)
Number of storeys in th	een carried out or is intended, pro ne dwelling (ns)	oceea to (17), otriei	wise continue ii	Om (9) to (16)		0	(9)
Additional infiltration	()			[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame	e or 0.35 for ma	asonry consti			0	(11)
if both types of wall are pro deducting areas of opening	esent, use the value correspondi	ng to the greater w	all area (after				_
	oor, enter 0.2 (unsealed) o	or 0.1 (sealed),	else enter 0			0	(12)
If no draught lobby, ent	,	, ,,				0	(13)
• •	and doors draught strippe	ed				0	(14)
Window infiltration		0.25	5 - [0.2 x (14) ÷ 1	100] =		0	(15)
Infiltration rate		(8)	+ (10) + (11) + (12) + (13) + (15) =		0	(16)
Air permeability value,	q50, expressed in cubic m	etres per hour	oer square m	etre of envelope	area	5	(17)
If based on air permeabili	ty value, then (18) = [(17) ÷ 2	0]+(8), otherwise (18) = (16)			0.38	(18)
Air permeability value applies	s if a pressurisation test has beer	done or a degree	air permeability	is being used			_
Number of sides sheltered	d					0	(19)
Shelter factor		` '	= 1 - [0.075 x (19)] =		1	(20)
Infiltration rate incorporati	-	(21)	= (18) x (20) =			0.38	(21)
Infiltration rate modified for	or monthly wind speed			, ,	1	1	
Jan Feb	Mar Apr May Ju	un Jul i	Aug Sep	Oct Nov	Dec		
Monthly average wind spe	eed from Table 7		1	1 1	Ī	1	

3.8

3.7

4.3

4

4.5

4.7

4.4

4.3

3.8

4.9

5

5.1

(22)m=

Wind Factor (22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infilt	ration rat	e (allowi	na for sl	nelter an	nd wind s	speed) =	= (21a) x	(22a)m					
0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45]	
Calculate effe		•	rate for t	he appli	cable ca	se					•	,	(00-)
If exhaust air h			endix N (2	² 3b) = (23a	a) × Fmv (e	equation ((N5)) othe	rwise (23h	n) = (23a)			0	(23a) (23b)
If balanced wit									(=00)			0	(23c)
a) If balanc	ed mech	anical ve	entilation	with he	at recov	ery (MV	'HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)		(200)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balanc	ed mech	anical ve	entilation	without	heat red	covery (MV) (24b	o)m = (2	2b)m + (23b)		•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I				•	•								
		`		´`	í – –		1c) = (22h	í –	<u> </u>	i 	1 .	1	(24-)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24c)
d) If natural if (22b)				•	•		on from 1 0.5 + [(2		0.5]				
(24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]	(24d)
Effective air	r change	rate - er	nter (24a	or (24l	o) or (24	c) or (2	4d) in box	x (25)				•	
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]	(25)
2 Heatless													
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	es and he Gros area		oarameto Openin m	ıgs	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value		A X k kJ/K
	Gros	SS	Openin	ıgs		m²	W/m2			K)			
ELEMENT	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
ELEMENT Doors	Gros area e 1	SS	Openin	ıgs	A ,r	m² x	W/m2	2K = 0.04] =	(W/ 2.28	K)			kJ/K (26)
ELEMENT Doors Windows Typ	Gros area e 1 e 2	SS	Openin	ıgs	A ,r 2.28 7.55	m² x x x	W/m2 1 1/[1/(1.4)+	= 0.04] = 0.04] =	(W/ 2.28 10.01	K)			kJ/K (26) (27)
ELEMENT Doors Windows Typ Windows Typ	Gros area e 1 e 2	SS	Openin	ıgs	A ,r 2.28 7.55 8.19	m² x x x x x	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+	EK = 0.04] = 0.04] = 0.04] =	(W/ 2.28 10.01 10.86	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2	SS	Openin	ıgs	A ,r 2.28 7.55 8.19 0.55	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) +	EK = 0.04] = 0.04] = 0.04] =	(W/ 2.28 10.01 10.86 0.73				kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights	Gros area e 1 e 2	ss (m²)	Openin	ngs n²	A ,r 2.28 7.55 8.19 0.55 1.01	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7)+ 0.13	2K =	(W/ 2.28 10.01 10.86 0.73 1.717				kJ/K (26) (27) (27) (27) (27b)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor	Gros area e 1 e 2 e 3	ss (m²)	Openin m	ngs n²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18	2K =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342				kJ/K (26) (27) (27) (27) (27b)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.84	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18	2K =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93				kJ/K (26) (27) (27) (27b) (28)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2	Gros area e 1 e 2 e 3	38 2 59	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.84 6.62	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18	EK =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19				kJ/K (26) (27) (27) (27b) (28) (29)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1	Gros area e 1 e 2 e 3 90.3 6.66 25.5	38 2 2 2	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19 3.2				kJ/K (26) (27) (27) (27) (27b) (28) (29) (29) (30)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22	38 (m²) 38 2 2 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.86 6.62 24.58	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18 0.13	EK =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19 3.2 0.81				kJ/K (26) (27) (27) (27) (27b) (28) (29) (29) (30) (30)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22	38 (m²) 38 2 2 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.84 6.62 24.58 6.22 3.72	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	EK =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of	Gros area e 1 e 2 e 3 90.3 6.6: 25.5 6.2: 3.7: elements	38 (m²) 38 2 2 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.84 6.62 24.58 6.22 3.72	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	EK =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (31)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of Party wall	Gros area e 1 e 2 e 3 90.3 6.6: 25.5 6.2: 3.7: elements	38 (m²) 38 2 2 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.84 6.62 24.58 6.22 165.8	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	EK =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (31) (32)
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of operty wall Internal wall *	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22 3.72 elements	38 (m²) 38 2 2 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.8* 6.62 24.58 6.22 3.72 165.8 77.56	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	EK =	(W/ 2.28 10.01 10.86 0.73 1.717 4.3342 12.93 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (30) (31) (32)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

48.42

(33)

Heat capacity Cm = S	S(Axk)						((28)	.(30) + (32	?) + (32a).	(32e) =	14227.94	(34)
Thermal mass param	eter (TMF	⊃ = Cm ÷	+ TFA) in	ı kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assessments w	here the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	200	
Thermal bridges : S (L x Y) cal	culated i	using Ap	pendix l	<						11.02	(36)
if details of thermal bridging	g are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric heat loss							(33) +	(36) =			59.44	(37)
Ventilation heat loss	calculated	monthly	У		•		(38)m	= 0.33 × (25)m x (5)			
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 45.62 45.28	44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer coefficie	ent, W/K						(39)m	= (37) + (3	38)m			
(39)m= 105.07 104.72	104.39	102.81	102.51	101.13	101.13	100.88	101.66	102.51	103.11	103.74		
Heat loss parameter	(HLP), W	/m²K						Average = = (39)m ÷	` '	12 /12=	102.81	(39)
(40)m= 1.17 1.16	1.16	1.14	1.14	1.12	1.12	1.12	1.13	1.14	1.14	1.15		
Number of days in mo	onth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.14	(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)
	-1		Į.		<u>I</u>							
4. Water heating end	ergy requi	irement:								kWh/ye	ear:	
Assumed occupancy, if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot was Reduce the annual average.	l + 1.76 x l vater usaç e hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed t	(25 x N)	+ 36		9)	.59		(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot w	l + 1.76 x l vater usaç e hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed t	(25 x N)	+ 36		9)			, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average	l + 1.76 x l vater usaç e hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed t	(25 x N)	+ 36		9)			, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual averag not more that 125 litres per	I + 1.76 x I Vater usage hot water r person per Mar	ge in litre usage by s day (all w	es per da 5% if the d vater use, h	ay Vd,ave lwelling is a not and con Jun	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us	e target o	9) 96	.59		, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per	tater usage hot water person per Mar er day for ea	ge in litre usage by s day (all w	es per da 5% if the d vater use, h	ay Vd,ave lwelling is a not and con Jun	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us	e target o	9) 96	.59		, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per	t + 1.76 x vater usage hot water r person per Mar er day for ea	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, t May Vd,m = fac 90.79	ay Vd,ave welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Sui	9) Nov 102.38 m(44) ₁₁₂ =	.59 Dec 106.25	1159.04	, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38	t + 1.76 x vater usage hot water r person per Mar er day for ea	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, t May Vd,m = fac 90.79	ay Vd,ave welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Sui	9) Nov 102.38 m(44) ₁₁₂ =	.59 Dec 106.25	1159.04	(43)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8	yater usage hot water r person per Mar er day for ea 98.52	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Suith (see Tai	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8	yater usage hot water reperson per Mar er day for ear 142.2	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97	es per da 5% if the d vater use, f May Vd,m = fact 90.79 onthly = 4.	y Vd,ave welling is not and con Jun ctor from 1 86.93 190 x Vd,n 102.65	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 90.79 109.15 boxes (46)	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Sur 128.72 Fotal = Sur	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ =	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67	yater usage hot water r person per Mar er day for ea 98.52	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Sui th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss:	yater usage hot water reperson per Mar 98.52 rused - calculating at point 21.33	ge in litre usage by s day (all w Apr ach month 94.66 culated mo 123.97	es per da 5% if the d vater use, h May Vd,m = fac 90.79	y Vd,avelwelling is not and constant from 186.93	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 77m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss: Storage volume (litres	yater usage hot water reperson per Mar er day for ear 98.52 rused - calculating at point 21.33	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 plar or W	y Vd,avi welling is not and col Jun ctor from 7 86.93 190 x Vd,ri 102.65 r storage), 15.4	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45) (46)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss:	ter used - calculating at point 21.33	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so	es per da 5% if the d vater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,avi welling is not and con Jun ctor from 1 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
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													(51)	
If community heating see section 4.3 Volume factor from Table 2a													1	
				2h							-	0		(52)
•	erature fa							(47) (54)	· · · (FO) · · · (E0\		0		(53)
	/ lost froi (50) or (_	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =	-	0		(54) (55)
	. , .	, ,	,	for each	month			((56)m = (55) × <i>(4</i> 1)	m		U		(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ (56)m = 0 0 0 0 0 0 0 0 0 0 0 0													1	(50)
	or contains	_		_	_	_	-	_	_		-	•	liv H	(56)
-		1											1	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	y circuit	•	•									0		(58)
	y circuit				,	,	,	` ,		r tharma	otot\			
(11100 (59)m=	dified by	0	0111111	0	nere is s	olar wal	er neau	ng and a	cylinde 0	T thermo	0	0		(59)
									0			0		(00)
	loss cal					<u> </u>	<u> </u>			T			1	(2.1)
(61)m=	50.96	46.03	50.2	46.68	46.27	42.87	44.3	46.27	46.68	50.2	49.32	50.96		(61)
								<u> </u>		ì '	` ´ 	`	(59)m + (61)m	
(62)m=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		(62)
	HW input c									r contribut	ion to wate	er heating)		
•	dditional										1		1	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
•	. 110111 WC												Ī	
(64)m=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		1
(64)m=	208.52	183.83	192.4					Outp	out from w	ater heate	I r (annual)₁	12	2090.41	(64)
(64)m=	208.52	183.83 n water	192.4	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	Outr + (61)m	out from w	ater heater	r (annual)₁ + (57)m	+ (59)m		_
(64)m= Heat g (65)m=	208.52 ains fron 65.13	183.83 n water 57.33	192.4 heating, 59.83	kWh/mo	onth 0.2	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	(64) (65)
(64)m= Heat g (65)m=	208.52	183.83 n water 57.33	192.4 heating, 59.83	kWh/mo	onth 0.2	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu	208.52 ains fron 65.13	183.83 n water 57.33 n in cald	192.4 heating, 59.83 culation of	kWh/mo 52.89 of (65)m	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	208.52 ains fron 65.13 ade (57)n	n water 57.33 n in calc ins (see	heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outp + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	208.52 ains from 65.13 ade (57)n ternal ga	n water 57.33 n in calc ins (see	heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	ains from 65.13 de (57)n ernal ga	n water 57.33 n in calc ins (see	heating, 59.83 culation of Table 5	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.29 51.12 only if c	5 ´ [0.85 44.85 ylinder is	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling	out from w 1] + 0.8 x 48.4 or hot w	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05	+ (59)m 63.48 munity h]	_
(64)m= Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ade (57)n ernal ga olic gains	183.83 n water 57.33 n in calco ins (see s (Table Feb 131.34	heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.2: 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05 com com	+ (59)m 63.48 munity h]	(65)
(64)m= Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34	183.83 n water 57.33 n in calco ins (see s (Table Feb 131.34	heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.2: 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05 com com	+ (59)m 63.48 munity h]	(65)
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Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	208.52 ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55	n water 57.33 n in calcoins (see S (Table Feb 131.34 (calcular 19.14	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heater x [(46)m 55.35 rater is fr Oct 131.34	+ (57)m 59.05 com com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ains from 65.13 Ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain	183.83 n water 57.33 n in calco ins (see S (Table Feb 131.34 (calculat 19.14 ns (calc 241.71	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 1 11.78 n Appendix 222.13	onth 0.23 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	208.52 ains from 65.13 de (57)n cernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22	183.83 n water 57.33 n in calco ins (see S (Table Feb 131.34 (calculat 19.14 ns (calc 241.71	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 1 11.78 n Appendix 222.13	onth 0.23 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
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Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	208.52 ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 and fan	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13 ns gains 3	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m	(annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 a and fan	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcular 36.13 as gains 3	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m	(annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 a and fan 3 s e.g. eva	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcula 36.13 as gains 3 aporatio -105.07	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5 3 n (negat	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3 tive value	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 3 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m 55.35 rater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77 212.87 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 and fan 3 s e.g. eva -105.07	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcula 36.13 as gains 3 aporatio -105.07	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5 3 n (negat	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3 tive value	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 3 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m 55.35 rater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77 212.87 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal	gains =	1			(6	6)m + (67)n	n + (68	3)m + (69)m	1 + (70)m +	· (71)m + (72	2)m	_	
(73)m= 413.71	411.55	396.84	372.78	348.24	324.6	309.8	316	.66 329.3	353.6	381.06	401.53		(73)
6. Solar gains	s:												
Solar gains are		•	r flux from	Table 6a		•	ations	to convert to	o the appli		ation.		
Orientation: /	Access F Fable 6d		Area m²			lux able 6a		g_ Table (3h	FF Table 6c		Gains (W)	
-	i able ou		- '''			able da	, ,	Table	JD	Table oc		((v v)	_
Southeast 0.9x	0.77	X	8.	19	X	36.79	X	0.63	X	0.7	=	92.09	(77)
Southeast 0.9x	0.77	X	8.	19	X	62.67	X	0.63	X	0.7	=	156.87	(77)
Southeast 0.9x	0.77	X	8.	19	X	85.75	X	0.63	X	0.7	=	214.64	(77)
Southeast 0.9x	0.77	X	8.	19	X	106.25	X	0.63	X	0.7	=	265.94	(77)
Southeast 0.9x	0.77	X	8.	19	X	119.01	X	0.63	X	0.7	=	297.88	(77)
Southeast 0.9x	0.77	X	8.	19	x	118.15	X	0.63	X	0.7	=	295.73	(77)
Southeast 0.9x	0.77	X	8.	19	x	113.91	X	0.63	X	0.7	=	285.11	(77)
Southeast 0.9x	0.77	X	8.	19	x	104.39	X	0.63	X	0.7	=	261.29	(77)
Southeast 0.9x	0.77	X	8.	19	X	92.85	X	0.63	X	0.7	=	232.41	(77)
Southeast 0.9x	0.77	X	8.	19	x	69.27	X	0.63	Х	0.7	=	173.37	(77)
Southeast 0.9x	0.77	X	8.	19	X	44.07	X	0.63	X	0.7	=	110.31	(77)
Southeast 0.9x	0.77	X	8.	19	X	31.49	x	0.63	X	0.7	=	78.81	(77)
Southwest _{0.9x}	0.77	X	0.5	55	X	36.79		0.63	X	0.7	=	6.18	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	62.67]	0.63	X	0.7	=	10.53	(79)
Southwest _{0.9x}	0.77	Х	0.8	55	x	85.75]	0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	106.25		0.63	X	0.7	=	17.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	119.01		0.63	X	0.7	=	20	(79)
Southwesto.9x	0.77	X	0.8	55	x	118.15		0.63	X	0.7	=	19.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	113.91]	0.63	Х	0.7	=	19.15	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	104.39		0.63	X	0.7	=	17.55	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	92.85		0.63	X	0.7	=	15.61	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	69.27		0.63	X	0.7	=	11.64	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	44.07		0.63	X	0.7	=	7.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	31.49		0.63	X	0.7	=	5.29	(79)
Northwest 0.9x	0.77	X	7.5	55	x	11.28	x	0.63	X	0.7	=	26.03	(81)
Northwest 0.9x	0.77	X	7.5	55	x	22.97	х	0.63	x	0.7	=	52.99	(81)
Northwest 0.9x	0.77	X	7.5	55	x	41.38	x	0.63	X	0.7	=	95.48	(81)
Northwest 0.9x	0.77	X	7.5	55	x	67.96	x	0.63	x	0.7	=	156.8	(81)
Northwest 0.9x	0.77	X	7.5	55	X	91.35	x	0.63	x	0.7	=	210.77	(81)
Northwest 0.9x	0.77	X	7.5	55	x	97.38	x	0.63	x	0.7	=	224.7	(81)
Northwest 0.9x	0.77	x	7.5	55	x	91.1	x	0.63	x	0.7		210.2	(81)
Northwest 0.9x	0.77	X	7.5		x	72.63	X	0.63	x	0.7		167.58	(81)
Northwest 0.9x	0.77	x	7.5		x	50.42] x	0.63	x	0.7		116.34	(81)
Northwest 0.9x	0.77	X	7.5		x	28.07	X	0.63	==	0.7	= =	64.76	(81)
5.5X	0.11	^				_0.07	J '	0.00	^	L 0.7		L 37.70	(-,

Northwest 0.9x	0.77	X	7.5	55	x	14.2	×	0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	×	0.63	x	0.7	=	21.26	(81)
Rooflights _{0.9x}	1	X	1.0)1	x	16.37	x [0.63	x [0.7		6.56	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	33.68	×	0.63	x	0.7	=	13.5	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	62.13	x [0.63	x	0.7		24.91	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	104.87	×	0.63	x	0.7	=	42.04	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	143.66	×	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	X	1.0)1	x	154.33	x	0.63	x	0.7		61.87	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	143.9	×	0.63	x	0.7	=	57.69	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	113.05	×	0.63	x	0.7		45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	×	0.63	x	0.7		30.69	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	41.49	x	0.63	x	0.7		16.63	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	20.65	×	0.63	x	0.7		8.28	(82)
Rooflights 0.9x	1	X	1.0)1	x	13.34	x	0.63	x	0.7		5.35	(82)
_							_						
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 130.87	233.9	349.43	482.64	586.24	602.16		491.7	73 395.04	266.41	158.75	110.71		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts	1			1		1	
(84)m= 544.59	645.45	746.27	855.42	934.48	926.81	881.95	808.3	39 724.42	620.07	539.81	512.25		(84)
7. Mean inter	nal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
								(- /					
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	(see T			(-)					
Utilisation fac	ctor for ga	ains for I Mar	iving are Apr	ea, h1,m May	(see T Jun		Au		Oct	Nov	Dec		
					<u> </u>	able 9a)	1	g Sep	Oct 0.97	Nov 1	Dec 1		(86)
(86)m= 1	Feb 0.99	Mar 0.98	Apr 0.95	May 0.84	Jun 0.66	able 9a) Jul 0.5	Au 0.56	g Sep 0.82		+			(86)
Jan	Feb 0.99	Mar 0.98	Apr 0.95	May 0.84	Jun 0.66	able 9a) Jul 0.5	Au 0.56	g Sep 0.82 able 9c)		+			(86)
Jan (86)m= 1	Feb 0.99 Il tempera 19.91	Mar 0.98 ature in l 20.19	Apr 0.95 living are 20.55	May 0.84 ea T1 (fo 20.83	Jun 0.66 ollow ste 20.96	Jul 0.5 eps 3 to 7 20.99	Au 0.56 7 in Ta 20.9	g Sep 5 0.82 able 9c) 9 20.89	0.97	1	1		
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature	Feb 0.99 Il temper 19.91 during h	Mar 0.98 ature in l 20.19	Apr 0.95 living are 20.55	0.84 ea T1 (fo 20.83	Jun 0.66 ollow sto 20.96 dwellin	Jul 0.5 eps 3 to 7 20.99	Au 0.56 7 in Ta 20.9	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C)	0.97	1	1		
Jan (86)m= 1	Feb 0.99 It tempers 19.91 during h	Mar 0.98 ature in l 20.19 eating p 19.95	Apr 0.95 living are 20.55 eriods ir 19.97	May 0.84 ea T1 (fo 20.83 n rest of 19.97	Jun 0.66 bllow sto 20.96 dwellin 19.98	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98	Au 0.567 in Ta 20.9 able 9 19.9	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C)	0.97	20.07	19.72		(87)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac	Feb 0.99 Il tempera 19.91 during h 19.95 etor for ga	Mar 0.98 ature in 1 20.19 eating p 19.95 ains for r	Apr 0.95 living are 20.55 eriods ir 19.97	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling,	Jun 0.66 ollow st 20.96 dwellin 19.98 h2,m (s	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table	Au 0.56 7 in Ta 20.9 able 9 19.9 9a)	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98	0.97 20.52 19.97	20.07	19.72		(87)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1	Feb 0.99 Il tempera 19.91 during h 19.95 etor for ga 0.99	Mar 0.98 ature in 1 20.19 eating p 19.95 ains for r 0.98	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79	Jun 0.66 ollow str 20.96 dwellin 19.98 h2,m (s	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39	Au 0.56 7 in Ta 20.9 able 9 19.9 9a) 0.44	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98	0.97 20.52 19.97	20.07	19.72		(87)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.91 during h 19.95 etor for ga 0.99 Il temper	Mar 0.98 ature in l 20.19 eating p 19.95 ains for r 0.98 ature in t	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do 0.93 the rest	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelli	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow ste	Au 0.567 in Ta 20.9 able 9 19.9 9a) 0.44	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 0.75 to 7 in Table	0.97 20.52 19.97 0.96 e 9c)	1 20.07 19.96	1 19.72 19.96		(87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1	Feb 0.99 Il tempera 19.91 during h 19.95 etor for ga 0.99	Mar 0.98 ature in 1 20.19 eating p 19.95 ains for r 0.98	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79	Jun 0.66 ollow str 20.96 dwellin 19.98 h2,m (s	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39	Au 0.56 7 in Ta 20.9 able 9 19.9 9a) 0.44	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 4 0.75 to 7 in Tabl 8 19.89	0.97 20.52 19.97 0.96 e 9c) 19.41	1 20.07 19.96 0.99 18.76	1 19.72 19.96 1		(87) (88) (89) (90)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.91 during h 19.95 etor for ga 0.99 Il temper	Mar 0.98 ature in l 20.19 eating p 19.95 ains for r 0.98 ature in t	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do 0.93 the rest	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelli	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow ste	Au 0.567 in Ta 20.9 able 9 19.9 9a) 0.44	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 4 0.75 to 7 in Tabl 8 19.89	0.97 20.52 19.97 0.96 e 9c) 19.41	1 20.07 19.96	1 19.72 19.96 1	0.27	(87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper: 19.91 during h 19.95 etor for ga 0.99 Il temper: 18.53	Mar 0.98 ature in 1 20.19 eating p 19.95 ains for r 0.98 ature in 1 18.93	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do 0.93 the rest 19.44	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelling 19.81	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57 ng T2 (able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow stern 19.98	Au 0.56 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 1	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 0.75 to 7 in Table 8 19.89	0.97 20.52 19.97 0.96 e 9c) 19.41	1 20.07 19.96 0.99 18.76	1 19.72 19.96 1	0.27	(87) (88) (89) (90)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1 Mean interna (90)m= 18.27	Feb 0.99 Il temper: 19.91 during h 19.95 etor for ga 0.99 Il temper: 18.53	Mar 0.98 ature in 1 20.19 eating p 19.95 ains for r 0.98 ature in 1 18.93	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do 0.93 the rest 19.44	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelling 19.81	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57 ng T2 (able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow stern 19.98	Au 0.56 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 1	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 0.75 to 7 in Tabl 8 19.89	0.97 20.52 19.97 0.96 e 9c) 19.41	1 20.07 19.96 0.99 18.76	1 19.72 19.96 1	0.27	(87) (88) (89) (90)
Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1 Mean interna (90)m= 18.27 Mean interna	Feb 0.99 al temper: 19.91 during h 19.95 etor for ga 0.99 al temper: 18.53	Mar 0.98 ature in 1 20.19 19.95 ains for r 0.98 ature in 1 18.93 ature (fo	Apr 0.95 living are 20.55 eriods ir 19.97 rest of de 0.93 the rest 19.44 r the wh	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelling 19.81 ole dwe 20.08	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57 ng T2 (19.96 lling) = 20.23	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow ste 19.98 fLA × T1 20.26	Au 0.56 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 i 19.9 + (1 - 20.2	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 1 0.75 to 7 in Tabl 8 19.89 f -fLA) × T2 5 20.16	0.97 20.52 19.97 0.96 e 9c) 19.41 LA = Livi	1 20.07 19.96 0.99 18.76 ng area ÷ (4	1 19.72 19.96 1 18.24 4) =	0.27	(87) (88) (89) (90) (91)
Jan (86)m= 1 1	Feb 0.99 al temper: 19.91 during h 19.95 etor for ga 0.99 al temper: 18.53	Mar 0.98 ature in 1 20.19 19.95 ains for r 0.98 ature in 1 18.93 ature (fo	Apr 0.95 living are 20.55 eriods ir 19.97 rest of de 0.93 the rest 19.44 r the wh	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelling 19.81 ole dwe 20.08	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57 ng T2 (19.96 lling) = 20.23	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow ste 19.98 fLA × T1 20.26	Au 0.56 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 i 19.9 + (1 - 20.2	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 0.75 to 7 in Tabl 8 19.89 f -fLA) × T2 5 20.16 where approximations	0.97 20.52 19.97 0.96 e 9c) 19.41 LA = Livi	1 20.07 19.96 0.99 18.76 ng area ÷ (4	1 19.72 19.96 1 18.24 4) =	0.27	(87) (88) (89) (90) (91)
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Jan (86)m= 1 Mean interna (87)m= 19.74 Temperature (88)m= 19.95 Utilisation fac (89)m= 1 Mean interna (90)m= 18.27 Mean interna (92)m= 18.67 Apply adjustr (93)m= 18.67 8. Space head set Ti to the the utilisation	Feb 0.99 I temperation for gases and temperation for gases and temperation for gases and temperation for gases and temperation factor factor for gases and temperation factor for gases and temperation factor	Mar 0.98 ature in l 20.19 leating p 19.95 ains for r 0.98 ature in t 18.93 ature (fo 19.27 he mean 19.27 direment ernal tern or gains to Mar	Apr 0.95 living are 20.55 eriods ir 19.97 rest of do 0.93 the rest 19.44 r the wh 19.74 internal 19.74 mperaturusing Ta Apr	May 0.84 ea T1 (for 20.83 n rest of 19.97 welling, 0.79 of dwelling 19.81 ole dwe 20.08 temper 20.08 re obtain able 9a	Jun 0.66 bllow str 20.96 dwellin 19.98 h2,m (s 0.57 ng T2 (19.96 lling) = 20.23 ature fr 20.23	able 9a) Jul 0.5 eps 3 to 7 20.99 g from Ta 19.98 eee Table 0.39 follow ste 19.98 fLA × T1 20.26 om Table 20.26 tep 11 of	Au 0.56 7 in Ta 20.9 able 9 19.9 0.44 eps 3 f 19.9 + (1 - 20.2 Table	g Sep 0.82 able 9c) 9 20.89 , Th2 (°C) 8 19.98 1 0.75 to 7 in Tabl 8 19.89 f -fLA) × T2 5 20.16 where appro 5 20.16 g Sep	0.97 20.52 19.97 0.96 e 9c) 19.41 LA = Livi 19.71 opriate 19.71 t Ti,m=	1 20.07 19.96 0.99 18.76 ng area ÷ (4 19.11 19.11 (76)m and	1 19.72 19.96 1 18.24 4) = 18.65		(87) (88) (89) (90) (91) (92)

Lloof	ul goine	hmCm	W = (0.	1)m v (0,	1)m									
(95)m=	ul gains, 542.39	639.35	727.58	790.13	746.08	550.56	367.24	384.07	552.05	591.56	535.16	510.71		(95)
	thly aver						307.24	304.07	332.03	391.30	333.10	310.71		(55)
(96)m=		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	<u> </u>			
(97)m=	1510.01	1466.57	1333.14	1114.78	859.45	569.67	369.75	388.84	616.39	934	1238.72	1498.49		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	/Vh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	719.91	555.89	450.53	233.75	84.35	0	0	0	0	254.78	506.56	734.91		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3540.68	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year								39.31	(99)
9a. Er	nergy red	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	ce heatir	•										г		_
	tion of sp					mentary	-					ļ	0	(201)
	tion of sp			-	` '			(202) = 1 -	,			ļ	1	(202)
	tion of to		_	-				(204) = (2	02) × [1 –	(203)] =			1	(204)
Effici	ency of i	main spa	ace heat	ing syste	em 1							ļ	93.4	(206)
Effici	ency of	seconda	ry/suppl	ementar	y heating	g systen	າ, %	-		_	_		0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Spac	e heatin		1 ·			<u> </u>		1			1			
	719.91	555.89	450.53	233.75	84.35	0	0	0	0	254.78	506.56	734.91		
(211)r	n = {[(98	i 				i		i	i	i	i			(211)
	770.78	595.17	482.37	250.27	90.31	0	0	0	0	272.78	542.35	786.85		_
								lota	i (kwn/yea	ar) =Sum(2	211) _{15,1012}	-	3790.87	(211)
	ce heatin	•			month									
- {[(90 (215)m	3)m x (20 0	0	00 + (20	0	0	0	0	0	0	0	0	0		
(= : 0)				, and the second				_			215) _{15,1012}		0	(215)
Water	r heating	1									7 15, 10 12	L		
	it from w	-	iter (calc	ulated al	bove)									
•	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		
Efficie	ncy of w	ater hea	ater										80.3	(216)
(217)m	87.92	87.66	87.12	85.84	83.45	80.3	80.3	80.3	80.3	85.94	87.4	88		(217)
	or water	•												
	n = (64) 237.18	m x 100 209.71) ÷ (217) 220.85	m 198.79	197.99	181.22	173.62	193.55	195.68	208.2	217.19	231.3		
(210)	207.10	200.7 1	220.00	100.70	107.00	101.22	170.02		I = Sum(2)		217.10	201.0	2465.27	(219)
Δnnιι	al totals								•		Wh/year		kWh/yea	
	e heating		ed, main	system	1						, • • • •	ſ	3790.87	_
Water	heating	fuel use	ed									[2465.27	Ħ
	icity for p			electric	keep-ho	t						L		
	al heatin				•							30		(230c)
		J												

boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =	75	(231)
Electricity for lighting			380.53	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =		6711.67	(338)
12a. CO2 emissions – Individual heating system	s including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216 =	818.83	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	532.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =		1351.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	197.49	(268)
Total CO2, kg/year	sum	of (265)(271) =	1587.75	(272)
				_

TER =

17.63

(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:55:15

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -BASE

Plot Reference: Sample 3

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.63 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.53 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²

2 Fabric U-values

Element Highest **Average** External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK

2a Thermal bridging

Openings

Thermal bridging calculated from linear thermal transmittances for each junction

1.20 (max. 2.00)

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 %

1.20 (max. 3.30)

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

OK

OK

OK

Regulations Compliance Report

6 Controls

Space heating controls TTZC by plumbing and electrical services

OK No cylinder thermostat

No cylinder

OK Boiler interlock: Yes

7 Low energy lights

Hot water controls:

Percentage of fixed lights with low-energy fittings 100.0% 75.0% OK Minimum

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Slight Overheating risk (Thames valley):

Based on:

Overshading: Average or unknown

Windows facing: North West 7.55m² Windows facing: South East 8.19m²0.55m² Windows facing: South West 1.01m² Roof windows facing: North West Ventilation rate: 4.00

10 Key features

Roofs U-value 0.12 W/m²K 0 W/m²K Party Walls U-value

OK

			User D	etails: _						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 20	12		Strom Softwa					0010943 on: 1.0.5.41	
		Pr	operty i	Address	: Sample	e 3				
Address: 1. Overall dwelling dime	noiona:									
1. Overall dwelling dime	11510115.		Δros	a(m²)		Av. Hei	iaht(m)		Volume(m ³	3)
Ground floor			_		(1a) x		.4	(2a) =	80.02	(3a)
First floor			3	3.34	(1b) x	2	7	(2b) =	90.02	(3b)
Second floor				23.4	(1c) x	2	.26](2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n		0.08	(4)]` ′	02.00	` ′
Dwelling volume	2, (12, (13, (12, (12,	-,(′	0.00)+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
									222.92	
2. Ventilation rate:		econdar	y	other		total			m³ per hou	ır
Number of chimneys	heating	heating 0] + [0	┐ = ┌	0	x	40 =	0	(6a)
Number of open flues	0 +	0] + [0]	0	x	20 =	0	(6b)
Number of intermittent far			J L			3	x	10 =	30	(7a)
Number of passive vents					L T	0	x	10 =	0	(7b)
Number of flueless gas fir					L F	0	x	40 =	0	(7c)
					L					(. •)
								Air ch	nanges per ho	our
Infiltration due to chimney						30		÷ (5) =	0.13	(8)
If a pressurisation test has be Number of storeys in th		led, proceed	l to (17), d	otherwise o	continue fr	om (9) to (16)			
Additional infiltration	ie dweiling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	25 for steel or timber	frame or	0.35 for	masonı	y consti	uction			0	(11)
if both types of wall are pro deducting areas of openin		sponding to	the great	er wall are	a (after					
If suspended wooden fl	- ' '	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2	! x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	ur per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then (18) = [(17) ÷ 20]+(8), otherwi	se (18) = ((16)				0.38	(18)
Air permeability value applies	•	as been don	e or a deg	gree air pe	rmeability	is being us	sed			
Number of sides sheltere	d			(20) = 1 -	IO 075 v /	10)1 -			0	(19)
Shelter factor	ing chalter to -t			(21) = (18	`	- [[1	(20)
Infiltration rate incorporati	_	_1		(21) - (10) X (20) -				0.38	(21)
Infiltration rate modified for	- 	1 1	11	Λ	0.5.7	Oct	Men	Des	1	
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind spe	eed from Table /	1 20		l 0.7		1.0		l	1	

4.4

4.3

3.8

3.8

3.7

4.5

4.7

Wind Factor (2	22a)m =	(22)m ÷	4						-			_	
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltra	ation rate	e (allowi	ing for sh	nelter an	d wind s	speed) =	= (21a) x	(22a)m					
0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45		
Calculate effect		•	rate for t	he appli	cable ca	se		-				0	(23a)
If exhaust air he			endix N, (2	23b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)			0	(23a)
If balanced with									, , ,			0	(23c)
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MV	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)		(2 2)
(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 red	covery (MV) (24b)m = (2	2b)m + (23b)	•	•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	e input	ventilati	on from o	outside		-			
if (22b)m		` 	<u> </u>	´`			í `	ŕ	.5 × (23b	ŕ –		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural v							on from I 0.5 + [(2		0.51				
(24d)m = 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	1	(24d)
Effective air		rate - er	iter (24a		o) or (24	c) or (24		(25)				J	
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]	(25)
2 Hoot lease	o and he	at loss i							•			ı	
3. Heat losses	s and he												
					Net Ar	rea	U-valı	ıe	AXU		k-value	<u>a</u>	ΑΧk
ELEMENT	Gros area	SS	oaramet Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²·l		A X k kJ/K
	Gros	SS	Openin	ıgs		m²			_	K)			
ELEMENT	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
ELEMENT Doors	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	eK = 0.04] =	(W/	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area e 1	SS	Openin	ıgs	A ,r 2.28 7.55	m² x x x x x x	W/m2 1 1/[1/(1.4)+	0.04] =	(W/ 2.28 10.01	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1	SS	Openin	ıgs	A ,r 2.28 7.55 8.19	m² x x x x x x x x x x x x x x x x x x x	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+	0.04] = 0.04] = 0.04] =	2.28 10.01 10.86	K)			kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area e 1	SS	Openin	ıgs	A ,r 2.28 7.55 8.19 0.55	m² x x x x x x x x x x x x x x x x x x x	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+	0.04] = 0.04] = 0.04] =	(W// 2.28 10.01 10.86 0.73				kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights	Gros area e 1	ss (m²)	Openin	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) +	0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.28 10.01 10.86 0.73 1.717				kJ/K (26) (27) (27) (27) (27b)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor	Gros area : 1 : 2 : 3	ss (m²)	Openin n	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.28 10.01 10.86 0.73 1.717 4.3342				kJ/K (26) (27) (27) (27) (27b)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	Gros area : 1 : 2 : 3 : 128.6	68 2	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18	0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82				kJ/K (26) (27) (27) (27) (27b) (28)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	Gros area 1 1 2 2 2 3 3 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	68 2 69	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 0.13 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82				kJ/K (26) (27) (27) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1	Gros area 1 1 2 2 2 3 128.6 6.62 25.5	68 2 2 2	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2				kJ/K (26) (27) (27) (27b) (28) (29) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area 1 1 28.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22	m ²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18 0.13	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (29) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3	Gros area 1 1 28.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.18 0.13	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type2 Roof Type2 Roof Type3 Total area of e	Gros area 1 1 2 2 2 3 3 128.6 6.62	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48				kJ/K (26) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (31) (32)
Doors Windows Type Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall	Gros area 1 1 2 2 2 3 3 128.6 6.62	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48				kJ/K (26) (27) (27) (27b) (28) (29) (29) (30) (30) (31)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall Internal wall **	Gros area 1 1 2 2 2 3 3 128.6 6.62	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48				kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall Internal wall ** Internal floor	Gros area 1 1 2 2 2 3 3 128.6 6.62 25.5 6.22 3.72 1ements	68 2 2 2 2 , m ²	Openin m 18.5 0 1.01 0 0	ngs 7	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26 95.5 56.74 alue calcul	m²	W/m2 1 1/[1/(1.4)+ 1/[1/(1.4)+ 1/[1/(1.7) + 0.13 0.18 0.13 0.13 0.13	eK = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W// 2.28 10.01 10.86 0.73 1.717 4.3342 19.82 1.19 3.2 0.81 0.48		kJ/m²·l		kJ/K (26) (27) (27) (27b) (28) (29) (30) (30) (31) (32) (32c)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

55.32

(33)

	า = S(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	14802.44	(34)
Thermal mass pa	, ,	1P = Cm -	÷ TFA) ir	ı kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assessme	nts where the o	letails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	200	(33)
can be used instead of					,							٦
Thermal bridges	` ,		• .	•	<						11.44	(36)
if details of thermal br Total fabric heat I		(nown (36) :	= 0.05 x (3	1)			(33) +	(36) =			66.75	(37)
Ventilation heat lo	oss calculate	ed monthl	V				(38)m	= 0.33 × (25)m x (5)			
	Feb Mar	ı	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
	5.28 44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer coe	fficient, W/K				<u> </u>	<u>I</u>	(39)m	= (37) + (3	38)m		1	
(39)m= 112.38 1°	12.04 111.7	110.12	109.82	108.45	108.45	108.19	108.98	109.82	110.42	111.05]	
Heat loss parame	eter (HLP) V	V/m²K						Average = = (39)m ÷	` '	12 /12=	110.12	(39)
	1.24 1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.23	1.23	1	
(2)								L Average =			1.22	(40)
Number of days i	n month (Ta	ble 1a)										
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28 31	30	31	30	31	31	30	31	30	31		(41)
4. Water heating	energy req	uirement:								kWh/y	ear:	
Assumed occupa if TFA > 13.9, N											1	(40)
if TFA £ 13.9, N Annual average h	N = 1 not water usa	age in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		9)	.59]	(42)
if TFA £ 13.9, N	N = 1 not water usa verage hot wate	age in litre	es per da 5% if the d	y Vd,av	erage = designed t	(25 x N)	+ 36		9)]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre	N = 1 not water usa verage hot wate es per person p	age in litre er usage by er day (all w	es per da 5% if the d vater use, f	y Vd,avelling is not and con	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9)	.59]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre	N = 1 not water usage hot waters es per person person per Mar	age in litre er usage by er day (all w	es per da 5% if the d vater use, f	y Vd,ave welling is not and con Jun	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre Jan Hot water usage in litre	N = 1 not water usage hot waters es per person person per Mar	age in litre er usage by er day (all w Apr each month	es per da 5% if the d vater use, f	y Vd,ave welling is not and con Jun	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9)	.59]	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre Jan Hot water usage in litre	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for	age in litre er usage by er day (all w	es per da 5% if the d vater use, f May Vd,m = fac	y Vd,ave welling is not and con Jun	erage = designed to designed t	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	Oct	9) 96 Nov	.59 Dec 106.25	1159.04	, ,
if TFA £ 13.9, N Annual average h Reduce the annual av not more that 125 litre Jan Hot water usage in litre	N = 1 not water usaverage hot water see per person p Feb Marres per day for 102.38 98.52	age in litre or usage by er day (all w Apr each month	es per da 5% if the d vater use, t May Vd,m = fac 90.79	y Vd,avi welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Su	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in lith (44)m= 106.25 10 Energy content of hot	N = 1 not water usaverage hot water see per person p Feb Marres per day for 102.38 98.52	age in litre or usage by er day (all w Apr each month	es per da 5% if the d vater use, t May Vd,m = fac 90.79	y Vd,avi welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Su	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litr (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2	age in litre or usage by er day (all w Apr each month 94.66 alculated me 123.97	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Total = Suith (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litr (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1	N = 1 not water usa verage hot wate es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2	age in litre or usage by er day (all w Apr each month 94.66 alculated me 123.97	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Total = Suith (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h The state of the annual average in literate of the state of	N = 1 not water usarerage hot water es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2 r heating at poi 0.67 21.33	age in litre or usage by er day (all w Apr each month 94.66 alculated me 123.97	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4.	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Total = Suith (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA £ 13.9, N Annual average h Reduce the annual average h not more that 125 litre Jan Hot water usage in litr (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1 If instantaneous water (46)m= 23.63 2 Water storage loss	N = 1 not water usa verage hot water se per person p Feb Marres per day for 102.38 98.52 water used - c 137.8 142.2 r heating at poin 10.67 21.33	age in litre rusage by er day (all was age) Apr each month 94.66 alculated me 123.97 ant of use (no 18.6	es per da 5% if the d vater use, h May Vd,m = fac 90.79	y Vd,avewelling is not and constant from 186.93	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 07m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	98.52 Total = Sunth (see Tail 128.72 Total = Sunth 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpretation of the second of the se	N = 1 not water usarerage hot water es per person p Feb Mar res per day for 02.38 98.52 water used - c 37.8 142.2 r heating at poi 0.67 21.33 ss: litres) includ	age in litre er usage by er day (all w Apr each month 94.66 123.97 nt of use (no	es per da 5% if the d yater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W	y Vd,avi welling is not and col Jun ctor from 7 86.93 190 x Vd,ri 102.65	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	98.52 Total = Sunth (see Tail 128.72 Total = Sunth 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpolation of the term of the ter	N = 1 not water usarerage hot water uses per person p Feb Marres per day for 102.38 98.52 water used - c 37.8 142.2 r heating at poi 10.67 21.33 ss: litres) includiting and no cored hot water uses	age in litre or usage by er day (all was age). Apr each month 94.66 123.97 Int of use (not all use). In the litroid in the l	es per da 5% if the d yater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W yelling, e	y Vd,avi welling is not and col Jun ctor from 1 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average in liter Jan Hot water usage in lite (44)m= 106.25 10 Energy content of hot (45)m= 157.56 1 If instantaneous water (46)m= 23.63 2 Water storage loss Storage volume (If community hear	N = 1 not water user resper day for 22.38 98.52 water used - c 37.8 142.2 r heating at point 1.33 SS: litres) includiting and not cored hot water used ses:	age in litre ar usage by er day (all w Apr each month 94.66 123.97 at of use (no 18.6 ing any setank in dw ter (this in	es per da 5% if the d yater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W yelling, e	y Vd,ave welling is not and contained and co	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpretation of the second of the se	N = 1 not water usarerage hot water uses per person p Feb Marres per day for 102.38 98.52 water used - c 137.8 142.2 r heating at poi 158: litres) includiting and not cored hot water is declared.	age in litre or usage by er day (all was each month) 94.66 123.97 nt of use (note that is in dwas each in dwas each in dwas each each each each each each each each	es per da 5% if the d yater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W yelling, e	y Vd,ave welling is not and contained and co	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) 96 Nov 102.38 m(44) ₁₁₂ = 10bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA £ 13.9, N Annual average h Reduce the annual average h Reduce the annual average h Interpolation of the term of the ter	N = 1 not water use verage hot water uses per person p Feb Marres per day for 102.38 98.52 water used - c 137.8 142.2 r heating at point 10.67 21.33 is: litres) includiting and not cored hot water uses or from Table 10.50 or from Tabl	age in litre or usage by er day (all was age by er day (all was age by er day (all was age) and a look alculated more alculate	es per da 5% if the d yater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W welling, e ncludes in	y Vd,ave welling is not and contained and co	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Suith (see Tail 128.72) Total = Suith 19.31 sel	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)

	iter stora	-			e 2 (kW	h/litre/da	ıy)					0		(51)
	munity h	•		on 4.3									1	
	e factor f			2h							-	0		(52)
•	erature fa							(47) (54)	· · · (FO) · · · (E0\		0		(53)
	/ lost froi (50) or (_	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =	-	0		(54) (55)
	storage	, ,	,	for each	month			((56)m = (55) × (41)	m		U		(55)
										1			1	(50)
(56)m=	0 er contains	0 dedicate	0 d solar sto	0	0 = (56)m	0	0 H11)1 ÷ (5	0	0 7)m = (56)	0 m where (0 H11) is fro	0 m Annend	liv H	(56)
-		1											1	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	y circuit	•	•									0		(58)
	y circuit				,	,	,	` ,		r tharma	otot\			
(11100 (59)m=	dified by	0	0111111	0	nere is s	olar wal	er neau	ng and a	cylinde 0	T thermo	0	0		(59)
									0			0		(00)
	loss cal					<u> </u>	<u> </u>			T			1	(2.1)
(61)m=	50.96	46.03	50.2	46.68	46.27	42.87	44.3	46.27	46.68	50.2	49.32	50.96		(61)
								<u> </u>		ì '	` ´ 	`	(59)m + (61)m	
(62)m=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		(62)
	HW input c									r contribut	ion to wate	er heating)		
•	dditional										1		1	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
Output	from wa	ater hea	ter											
•	. 110111 WC												Ī	
(64)m=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		1
(64)m=	208.52	183.83	192.4					Outp	out from w	ater heate	I r (annual)₁	12	2090.41	(64)
(64)m=	208.52	183.83 n water	192.4	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	Outr + (61)m	out from w	ater heater	r (annual)₁ + (57)m	+ (59)m		_
(64)m= Heat g (65)m=	208.52 ains fron 65.13	183.83 n water 57.33	192.4 heating, 59.83	kWh/mo	onth 0.2	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	(64) (65)
(64)m= Heat g (65)m=	208.52	183.83 n water 57.33	192.4 heating, 59.83	kWh/mo	onth 0.2	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu	208.52 ains fron 65.13	183.83 n water 57.33 n in cald	192.4 heating, 59.83 culation of	kWh/mo 52.89 of (65)m	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	208.52 ains fron 65.13 ade (57)n	n water 57.33 n in calc ins (see	heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	208.52 ains from 65.13 ade (57)n ternal ga	n water 57.33 n in calc ins (see	heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heater ([(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
(64)m= Heat g (65)m= inclu 5. Int	ains from 65.13 de (57)n ernal ga	n water 57.33 n in calc ins (see	heating, 59.83 culation of Table 5	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.29 51.12 only if c	5 ´ [0.85 44.85 ylinder is	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling	out from w 1] + 0.8 x 48.4 or hot w	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05	+ (59)m 63.48 munity h]	_
(64)m= Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ade (57)n ernal ga olic gains	183.83 n water 57.33 n in calco ins (see s (Table Feb 131.34	heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.2: 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05 com com	+ (59)m 63.48 munity h]	(65)
(64)m= Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34	183.83 n water 57.33 n in calco ins (see s (Table Feb 131.34	heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.2: 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heater x [(46)m 55.35 vater is fr	+ (57)m 59.05 com com	+ (59)m 63.48 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (n water 57.33 n in calcoins (see S (Table Feb 131.34 (calcular 19.14	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heater x [(46)m 55.35 rater is fr Oct 131.34	+ (57)m 59.05 com com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	208.52 ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55	n water 57.33 n in calcoins (see S (Table Feb 131.34 (calcular 19.14	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81	Jun 131.34 ion L9 oi	× (45)m 42.7 s in the o Jul 131.34 r L9a), a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heater x [(46)m 55.35 rater is fr Oct 131.34	+ (57)m 59.05 com com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ains from 65.13 Ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain	183.83 n water 57.33 n in calco ins (see S (Table Feb 131.34 (calculat 19.14 ns (calc 241.71	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 1 11.78 n Appendix 222.13	onth 0.23 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	208.52 ains from 65.13 de (57)n cernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22	183.83 n water 57.33 n in calco ins (see S (Table Feb 131.34 (calculat 19.14 ns (calc 241.71	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 1 11.78 n Appendix 222.13	onth 0.23 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ot 17.8 ble 5 196.06	(annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	ains from 65.13 Ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ot 17.8 ble 5 196.06	(annual), + (57)m 59.05 com com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	208.52 ains from 65.13 ide (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ot 17.8 ble 5 196.06	(annual), + (57)m 59.05 com com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 and fan	183.83 n water 57.33 n in calc ins (see s (Table Feb 131.34 (calculat 19.14 ns (calc 241.71 (calculat 36.13 ns gains 3	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m	(annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 a and fan	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcular 36.13 as gains 3	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 51.12 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m	(annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 a and fan 3 s e.g. eva	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcula 36.13 as gains 3 aporatio -105.07	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5 3 n (negat	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3 tive value	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 3 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m 55.35 rater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77 212.87 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	208.52 ains from 65.13 de (57)n ernal ga olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains 36.13 and fan 3 s e.g. eva -105.07	n water 57.33 n in calc ins (see s (Table Feb 131.34 (calcular 19.14 ns (calc 241.71 (calcula 36.13 as gains 3 aporatio -105.07	heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in A 36.13 (Table 5 3 n (negat	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3 tive value	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 3 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heater ([(46)m 55.35 rater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	(annual) ₁ + (57)m 59.05 com com Nov 131.34 20.77 212.87 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal	gains =	1			(6	6)m + (67)n	n + (68	3)m + (69)m	1 + (70)m +	· (71)m + (72	2)m	_	
(73)m= 413.71	411.55	396.84	372.78	348.24	324.6	309.8	316	.66 329.3	353.6	381.06	401.53		(73)
6. Solar gains	s:												
Solar gains are		•	r flux from	Table 6a		•	ations	to convert to	o the appli		ation.		
Orientation: /	Access F Fable 6d		Area m²			lux able 6a		g_ Table (3h	FF Table 6c		Gains (W)	
-	i able ou		- '''			able da	, ,	Table	JD	Table oc		((v v)	_
Southeast 0.9x	0.77	X	8.	19	X	36.79	X	0.63	X	0.7	=	92.09	(77)
Southeast 0.9x	0.77	X	8.	19	X	62.67	X	0.63	X	0.7	=	156.87	(77)
Southeast 0.9x	0.77	X	8.	19	X	85.75	X	0.63	X	0.7	=	214.64	(77)
Southeast 0.9x	0.77	X	8.	19	X	106.25	X	0.63	X	0.7	=	265.94	(77)
Southeast 0.9x	0.77	X	8.	19	X	119.01	X	0.63	X	0.7	=	297.88	(77)
Southeast 0.9x	0.77	X	8.	19	x	118.15	X	0.63	X	0.7	=	295.73	(77)
Southeast 0.9x	0.77	X	8.	19	x	113.91	X	0.63	X	0.7	=	285.11	(77)
Southeast 0.9x	0.77	X	8.	19	x	104.39	X	0.63	X	0.7	=	261.29	(77)
Southeast 0.9x	0.77	X	8.	19	X	92.85	X	0.63	X	0.7	=	232.41	(77)
Southeast 0.9x	0.77	X	8.	19	x	69.27	X	0.63	Х	0.7	=	173.37	(77)
Southeast 0.9x	0.77	X	8.	19	X	44.07	X	0.63	X	0.7	=	110.31	(77)
Southeast 0.9x	0.77	X	8.	19	X	31.49	x	0.63	X	0.7	=	78.81	(77)
Southwest _{0.9x}	0.77	X	0.5	55	X	36.79		0.63	X	0.7	=	6.18	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	62.67]	0.63	X	0.7	=	10.53	(79)
Southwest _{0.9x}	0.77	Х	0.8	55	x	85.75]	0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	106.25		0.63	X	0.7	=	17.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	119.01		0.63	X	0.7	=	20	(79)
Southwesto.9x	0.77	X	0.8	55	x	118.15		0.63	X	0.7	=	19.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	113.91]	0.63	X	0.7	=	19.15	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	104.39		0.63	X	0.7	=	17.55	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	92.85		0.63	X	0.7	=	15.61	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	69.27		0.63	X	0.7	=	11.64	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	44.07		0.63	X	0.7	=	7.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	x	31.49		0.63	X	0.7	=	5.29	(79)
Northwest 0.9x	0.77	X	7.5	55	x	11.28	x	0.63	X	0.7	=	26.03	(81)
Northwest 0.9x	0.77	X	7.5	55	x	22.97	х	0.63	x	0.7	=	52.99	(81)
Northwest 0.9x	0.77	X	7.5	55	x	41.38	x	0.63	X	0.7	=	95.48	(81)
Northwest 0.9x	0.77	X	7.5	55	x	67.96	x	0.63	x	0.7	=	156.8	(81)
Northwest 0.9x	0.77	X	7.5	55	X	91.35	x	0.63	x	0.7	=	210.77	(81)
Northwest 0.9x	0.77	X	7.5	55	x	97.38	x	0.63	x	0.7	=	224.7	(81)
Northwest 0.9x	0.77	x	7.5	55	x	91.1	x	0.63	x	0.7		210.2	(81)
Northwest 0.9x	0.77	X	7.5		x	72.63	X	0.63	x	0.7		167.58	(81)
Northwest 0.9x	0.77	x	7.5		x	50.42] _X	0.63	x	0.7		116.34	(81)
Northwest 0.9x	0.77	X	7.5		x	28.07	X	0.63	==	0.7	= =	64.76	(81)
5.5X	0.11	^				_0.07	J '	0.00	^	L 0.7		L 37.70	(-,

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x [0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x [0.63	x [0.7	=	21.26	(81)
Rooflights _{0.9x}	1	X	1.0)1	x	16.37] x [0.63	x [0.7		6.56	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	33.68	x [0.63	x	0.7	=	13.5	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	62.13	x [0.63	x	0.7		24.91	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	104.87	×	0.63	x	0.7	=	42.04	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	143.66	×	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	X	1.0)1	x	154.33	×	0.63	x	0.7		61.87	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	143.9	×	0.63	x	0.7	=	57.69	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	113.05	×	0.63	x	0.7		45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	x	0.63	x	0.7		30.69	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	41.49	x	0.63	×	0.7		16.63	(82)
Rooflights _{0.9x}	1	X	1.0)1	x	20.65	x	0.63	×	0.7		8.28	(82)
Rooflights 0.9x	1	X	1.0)1	x	13.34	x	0.63	×	0.7		5.35	(82)
_							_						
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 130.87	233.9	349.43	482.64	586.24	602.16	572.15	491.	73 395.04	266.41	158.75	110.71		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	ı , watts						•	
(84)m= 544.59	645.45	746.27	855.42	934.48	926.81	881.95	808.3	39 724.42	620.07	539.81	512.25		(84)
7. Mean inter	nal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ole 9.	Th1 (°C)				21	(85)
					-		,	()					` ′
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	_		,	(3)					``
Utilisation fac	ctor for g	ains for l Mar	iving are Apr	ea, h1,m May	_		Au		Oct	Nov	Dec		``
					(see T	able 9a)	1	g Sep	Oct 0.97	Nov 1	Dec 1		(86)
(86)m= 1	Feb 0.99	Mar 0.99	Apr 0.95	May 0.86	Jun 0.69	Jul 0.53	Au 0.59	g Sep 0 0.84		+			
Jan	Feb 0.99	Mar 0.99	Apr 0.95	May 0.86	Jun 0.69	Jul 0.53	Au 0.59	g Sep 0 0.84 able 9c)		+			
(86)m= 1 Mean interna (87)m= 19.63	Feb 0.99 Il temper 19.81	Mar 0.99 ature in 1 20.09	Apr 0.95 living are 20.47	May 0.86 ea T1 (fo 20.78	(see T Jun 0.69 ollow st 20.95	Jul 0.53 eps 3 to 7 20.99	0.59 7 in Ta 20.9	g Sep 0.84 able 9c) 8 20.85	0.97	1	1		(86)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature	Feb 0.99 Il temper 19.81	Mar 0.99 ature in 1 20.09	Apr 0.95 living are 20.47	May 0.86 ea T1 (fo 20.78	Jun 0.69 bllow st 20.95 dwellin	Jul 0.53 eps 3 to 7 20.99	0.59 7 in Ta 20.9	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C)	0.97	1	1		(86)
Jan (86)m= 1	Feb 0.99 Il temper 19.81 during h	Mar 0.99 ature in l 20.09 neating p	Apr 0.95 living are 20.47 eriods ir	May 0.86 ea T1 (fo 20.78 n rest of 19.9	Jun 0.69 Ollow st 20.95 dwellin 19.92	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92	Au 0.597 in Ta 20.99 able 9	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C)	0.97	19.97	19.61		(86)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r	Apr 0.95 living are 20.47 eriods ir 19.9	May 0.86 ea T1 (for 20.78 rest of 19.9 welling,	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table	Au 0.59 7 in Ta 20.9 able 9 19.9	g Sep 0 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91	0.97 20.45 19.9	19.97	19.61		(86) (87) (88)
Jan (86)m= 1	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4	Au 0.597 in Ta 20.99 able 9 19.9 9a) 0.46	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91	0.97 20.45 19.9	19.97	19.61		(86)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.81 during h 19.89 etor for gas 0.99 Il temper	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do 0.94 the rest	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelli	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4	Au 0.597 in Ta 20.99 able 9 19.9 9a) 0.46	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 6 0.77 to 7 in Table	0.97 20.45 19.9 0.96 e 9c)	1 19.97 19.9 0.99	1 19.61 19.89		(86) (87) (88) (89)
Jan (86)m= 1	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4	Au 0.597 in Ta 20.99 able 9 19.9 9a) 0.46	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 to 7 in Table 1 19.8	0.97 20.45 19.9 0.96 e 9c) 19.26	19.97 19.9 0.99	1 19.61 19.89 1		(86) (87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.81 during h 19.89 etor for gas 0.99 Il temper	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do 0.94 the rest	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelli	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4	Au 0.597 in Ta 20.99 able 9 19.9 9a) 0.46	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 to 7 in Table 1 19.8	0.97 20.45 19.9 0.96 e 9c) 19.26	1 19.97 19.9 0.99	1 19.61 19.89 1	0.27	(86) (87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99 Il temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling	(see T Jun 0.69 b) llow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (gable 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 (follow steens)	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 6 0.77 to 7 in Tabl 1 19.8	0.97 20.45 19.9 0.96 e 9c) 19.26	19.97 19.9 0.99	1 19.61 19.89 1	0.27	(86) (87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99 Il temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling	(see T Jun 0.69 b) llow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (gable 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 (follow steens)	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3	g Sep 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 to 7 in Table 1 19.8 f -fLA) × T2	0.97 20.45 19.9 0.96 e 9c) 19.26	19.97 19.9 0.99	1 19.61 19.89 1	0.27	(86) (87) (88) (89)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07	Feb 0.99 al temper 19.81 during h 19.89 etor for ga 0.99 al temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74 ature (fo	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28 r the wh	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling 19.69 ole dwe 19.99	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (19.88 llling) = 20.17	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 follow ste 19.91 fLA × T1 20.21	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3 19.9 + (1 - 20.2	g Sep 0.84 able 9c) 8 20.85 , Th2 (°C) 2 19.91 6 0.77 to 7 in Tabl 1 19.8 f -fLA) × T2 2 20.08	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi	1 19.97 19.9 0.99 18.58 ng area ÷ (4	1 19.61 19.89 1 18.04 4) =	0.27	(86) (87) (88) (89) (90) (91)
Jan (86)m= 1	Feb 0.99 al temper 19.81 during h 19.89 etor for ga 0.99 al temper 18.33	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74 ature (fo	Apr 0.95 living are 20.47 eriods ir 19.9 rest of de 0.94 the rest 19.28 r the wh	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling 19.69 ole dwe 19.99	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (19.88 llling) = 20.17	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 follow ste 19.91 fLA × T1 20.21	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3 19.9 + (1 - 20.2	g Sep 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 6 0.77 to 7 in Table 1 19.8 fl-fLA) × T2 2 20.08 where approximation of the process of the	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi	1 19.97 19.9 0.99 18.58 ng area ÷ (4	1 19.61 19.89 1 18.04 4) =	0.27	(86) (87) (88) (89) (90) (91)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07 Mean interna (92)m= 18.5 Apply adjustr (93)m= 18.5 8. Space hear	Feb 0.99 Il temper 19.81 during h 19.89 etor for ga 0.99 Il temper 18.33 Il temper 18.73 ment to tl 18.73 atting requ	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t 18.74 ature (fo 19.11 he mean 19.11 uirement	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do 0.94 the rest 19.28 r the wh 19.61 internal 19.61	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling 19.69 tole dwe 19.99 temper 19.99	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (19.88 blling) = 20.17 ature fr 20.17	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 follow ste 19.91 fLA × T1 20.21 om Table 20.21	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3 19.9 + (1 - 20.2 4e, v 20.2	g Sep 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 6 0.77 to 7 in Table 1 19.8 f -fLA) × T2 2 20.08 where approx 2 20.08	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi 19.59 ppriate 19.59	1 19.97 19.99 0.99 18.58 ng area ÷ (4 18.96	1 19.61 19.89 1 18.04 4) =		(86) (87) (88) (89) (90) (91)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07 Mean interna (92)m= 18.5 Apply adjustr (93)m= 18.5 8. Space head Set Ti to the	Feb 0.99 Il temper 19.81 during h 19.89 ctor for ga 0.99 Il temper 18.33 Il temper 18.73 ment to th 18.73 ating requesting r	Mar 0.99 ature in 1 20.09 neating p 19.89 ains for r 0.98 ature in 1 18.74 ature (fo 19.11 he mean 19.11 uirement ternal ternal	Apr 0.95 living are 20.47 eriods ir 19.9 rest of do 0.94 the rest 19.28 r the wh 19.61 internal 19.61	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling, 19.69 tole dwe 19.99 temper 19.99 re obtain	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (19.88 blling) = 20.17 ature fr 20.17	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 follow ste 19.91 fLA × T1 20.21 om Table 20.21	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3 19.9 + (1 - 20.2 4e, v 20.2	g Sep 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 6 0.77 to 7 in Table 1 19.8 f -fLA) × T2 2 20.08 where approx 2 20.08	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi 19.59 ppriate 19.59	1 19.97 19.99 0.99 18.58 ng area ÷ (4 18.96	1 19.61 19.89 1 18.04 4) =		(86) (87) (88) (89) (90) (91)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07 Mean interna (92)m= 18.5 Apply adjustr (93)m= 18.5 Set Ti to the the utilisation	Feb 0.99 Itemper 19.81 during h 19.89 ctor for ga 0.99 Itemper 18.33 Itemper 18.73 ment to th 18.73 ating requires	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t 18.74 ature (fo 19.11 he mean 19.11 uirement ternal tern or gains to	Apr 0.95 living are 20.47 eriods ir 19.9 eest of do 0.94 the rest 19.28 r the wh 19.61 internal 19.61 mperaturusing Ta	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling 19.69 ole dwe 19.99 temper 19.99 re obtain able 9a	(see T Jun 0.69 ollow st 20.95 ollow st 19.92 ollow st 19.88 ollow st 20.17 ollow	Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 eee Table 0.4 follow ste 19.91 etc. 19.91 etc. 20.21 etc. 20.21 etc. 11 of	Au 0.59 7 in Ta 20.9 able 9 19.9 0.46 eps 3 19.9 + (1 - 20.2 Table	g Sep 0 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 6 0.77 to 7 in Tabl 1 19.8 fl-fLA) × T2 2 20.08 where approx 2 20.08	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi 19.59 ppriate 19.59 t Ti,m=	1 19.97 19.99 0.99 18.58 ng area ÷ (4 18.96 (76)m and	1 19.61 19.89 1 18.04 4) = 18.47 18.47		(86) (87) (88) (89) (90) (91)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07 Mean interna (92)m= 18.5 Apply adjustr (93)m= 18.5 8. Space head Set Ti to the the utilisation Jan	Feb 0.99 I temper 19.81 during h 19.89 ctor for ga 0.99 I temper 18.73 ment to tl 18.73 ating required factor for for ga required factor for ga The second factor for ga Feb	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t 18.74 ature (fo 19.11 he mean 19.11 uirement rernal ter or gains to Mar	Apr 0.95 living are 20.47 eriods ir 19.9 est of do 0.94 the rest 19.28 r the wh 19.61 internal 19.61 mperaturusing Ta Apr	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling, 19.69 tole dwe 19.99 temper 19.99 re obtain	(see T Jun 0.69 bllow st 20.95 dwellin 19.92 h2,m (s 0.6 ng T2 (19.88 blling) = 20.17 ature fr 20.17	able 9a) Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 see Table 0.4 follow ste 19.91 fLA × T1 20.21 om Table 20.21	Au 0.59 7 in Ta 20.9 able 9 19.9 9a) 0.46 eps 3 19.9 + (1 - 20.2 4e, v 20.2	g Sep 0 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 6 0.77 to 7 in Table 1 19.8 fl-fLA) × T2 2 20.08 where approx 2 20.08	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi 19.59 ppriate 19.59	1 19.97 19.99 0.99 18.58 ng area ÷ (4 18.96	1 19.61 19.89 1 18.04 4) =		(86) (87) (88) (89) (90) (91)
Jan (86)m= 1 Mean interna (87)m= 19.63 Temperature (88)m= 19.88 Utilisation fac (89)m= 1 Mean interna (90)m= 18.07 Mean interna (92)m= 18.5 Apply adjustr (93)m= 18.5 Set Ti to the the utilisation	Feb 0.99 I temper 19.81 during h 19.89 ctor for ga 0.99 I temper 18.73 ment to tl 18.73 ating required factor for for ga required factor for ga The second factor for ga Feb	Mar 0.99 ature in l 20.09 neating p 19.89 ains for r 0.98 ature in t 18.74 ature (fo 19.11 he mean 19.11 uirement rernal ter or gains to Mar	Apr 0.95 living are 20.47 eriods ir 19.9 est of do 0.94 the rest 19.28 r the wh 19.61 internal 19.61 mperaturusing Ta Apr	May 0.86 ea T1 (for 20.78 n rest of 19.9 welling, 0.81 of dwelling 19.69 ole dwe 19.99 temper 19.99 re obtain able 9a	(see T Jun 0.69 ollow st 20.95 ollow st 19.92 ollow st 19.88 ollow st 20.17 ollow	Jul 0.53 eps 3 to 7 20.99 g from Ta 19.92 eee Table 0.4 follow ste 19.91 etc. 19.91 etc. 20.21 etc. 20.21 etc. 11 of	Au 0.59 7 in Ta 20.9 able 9 19.9 0.46 eps 3 19.9 + (1 - 20.2 Table	g Sep 0 0.84 able 9c) 8 20.85 Th2 (°C) 2 19.91 6 0.77 to 7 in Table 1 19.8 f -fLA) × T2 2 20.08 where approx 2 20.08 e 9b, so that g Sep	0.97 20.45 19.9 0.96 e 9c) 19.26 LA = Livi 19.59 ppriate 19.59 t Ti,m=	1 19.97 19.99 0.99 18.58 ng area ÷ (4 18.96 (76)m and	1 19.61 19.89 1 18.04 4) = 18.47 18.47		(86) (87) (88) (89) (90) (91)

Hoof	ul aging	hmCm	W = (0.	1)m v (0	4\m									
(95)m=	ul gains, 542.31	639.39	$\frac{1}{728.45}$	795.52	762.89	575.41	386.78	403.65	566.64	593.47	535.18	510.63		(95)
	thly avera						360.76	403.03	300.04	393.47	333.10	310.03		(55)
(96)m=		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	ial tempe	erature,	Lm , W :	=[(39)m:	x [(93)m	– (96)m]	<u> </u>			
(97)m=	1595.36	1549.59	1408.52	1178.93	910.08	604.23	391.05	411.41	652.21	986.86	1309.5	1584.49		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	783.47	611.65	505.97	276.06	109.51	0	0	0	0	292.68	557.51	798.95		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3935.8	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/year								43.69	(99)
9a. Er	nergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	ce heatir	•												_
	tion of sp			•		mentary	system					ļ	0	(201)
	tion of sp			•	, ,			(202) = 1 -	, ,			ļ	1	(202)
	tion of to		_	-				(204) = (2	02) × [1 –	(203)] =			1	(204)
Effici	ency of r	main spa	ace heat	ing syste	em 1								93.4	(206)
Effici	ency of s	seconda	ry/suppl	ementar	y heating	g systen	າ, %	-		_	_		0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Spac	e heatin		1 ·		·	<u> </u>	1	1		1				
	783.47	611.65	505.97	276.06	109.51	0	0	0	0	292.68	557.51	798.95		
(211)r	n = {[(98					i	i	i		i	i			(211)
	838.83	654.88	541.73	295.56	117.25	0	0	0	0	313.36	596.91	855.41		_
								lota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	. [4213.92	(211)
-	ce heatin	•		• .	month									
- {[(96 (215)m:	3)m x (20 0	0 0	00 + (20	0	0	0	0	0	0	0	0	0		
(210)								_			215) _{15,1012}		0	(215)
Water	r heating	1									10,1012	L		` ′
	it from w		iter (calc	ulated a	bove)									
	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		
Efficie	ncy of w	ater hea	ater										80.3	(216)
(217)m	88.07	87.85	87.37	86.26	84.04	80.3	80.3	80.3	80.3	86.28	87.6	88.15		(217)
	or water	•												
` ,	m = (64) 236.76	m x 100 209.26	220.21	197.85	196.59	181.22	173.62	193.55	195.68	207.37	216.69	230.91		
(=10)	2000								I = Sum(2:			1 200.01	2459.72	(219)
Annu	al totals								•		Wh/year		kWh/yea	
	e heating		ed, main	system	1					•••		Γ	4213.92	<u> </u>
Water	heating	fuel use	ed									[2459.72	_
	icity for p			alaatria	koon ho	+						L		_
		Juliipo, i	ans and	electric	veeh-110	ι								
centr	ral heatin	·		electric	кеер-по	ı						30		(230c)

boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	75	(231)
Electricity for lighting			380.53	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =		7129.17	(338)
12a. CO2 emissions – Individual heating system	s including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	910.21	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216	531.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =		1441.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	197.49	(268)
Total CO2, kg/year	sum	of (265)(271) =	1677.93	(272)

TER =

18.63

(273)



Appendix B

Energy Efficient Design:-

SAP Outputs & Dwelling Emission Rates

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:51:29

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -BASE

Plot Reference: Sample 1

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.63 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.53 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²

2 Fabric U-values

Element Highest **Average** External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 %

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

OK

OK

Regulations Compliance Report

6 Controls

Space heating controls TTZC by plumbing and electrical services

OK No cylinder thermostat

No cylinder

OK Boiler interlock: Yes

7 Low energy lights

Hot water controls:

Percentage of fixed lights with low-energy fittings 100.0% 75.0% OK Minimum

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Slight Overheating risk (Thames valley):

Based on:

Overshading: Average or unknown

Windows facing: North West 7.55m² Windows facing: South East 8.19m²0.55m² Windows facing: South West 1.01m² Roof windows facing: North West Ventilation rate: 4.00

10 Key features

Roofs U-value 0.12 W/m²K 0 W/m²K Party Walls U-value

OK

			User D	etails:						
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12		Softwa	are Vei	sion:		Versio	n: 1.0.5.41	
		Р	roperty ,	Address	: Sample	e 1				
Address :	a atau a									
Overall dwelling dime	nsions:		Aros	a(m²)		Av. Hei	iaht(m)		Volume(m³)	\ \
Ground floor				3.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			3	3.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor			2	23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 9	0.08	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + [0	j = [0	x	20 =	0	(6b)
Number of intermittent far	ns					3	x -	10 =	30	(7a)
Number of passive vents					Ī	0	x -	10 =	0	(7b)
Number of flueless gas fir	res					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s flues and fans = (6a)+(6b)+(7	'a)+(7b)+(7c) =	г	30		÷ (5) =	0.13	(8)
If a pressurisation test has be					continue fr			- (3) –	0.13	(6)
Number of storeys in th	ne dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.					•	uction			0	(11)
if both types of wall are producting areas of openin		sponding to	the great	er wall are	a (after					
If suspended wooden fl		led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	! x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = ((16)				0.38	(18)
Air permeability value applies		s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltere	d			(20) - 1	[0.075 x (1	0)1 -			0	(19)
Shelter factor	to a challent a to			,	`	9)] -			1	(20)
Infiltration rate incorporati	-	d		(21) = (18) x (20) =				0.38	(21)
Infiltration rate modified for			Jul	۸۰۰۰	Son	Oct	Nov	Dec		
		Jun	Jui	Aug	Sep	OCI	INOV	l Dec		
Monthly average wind spo		20	20	27	1	4.3	1 F	17		
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Factor (2	2a)m =	(22)m ÷	4											
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjusted infiltra	ation rate	e (allowi	ing for sl	nelter an	d wind s	speed) =	= (21a) x	(22a)m						
0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45			
Calculate effect		•	rate for t	he appli	cable ca	ise				•				220
If exhaust air he			endix N. (2	23b) = (23a	a) × Fmv (e	eguation ((N5)) . othe	rwise (23b) = (23a)			0		23a) 23b)
If balanced with									, (,			0		23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recov	ery (MV	/HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)			,
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2	24a)
b) If balance	d mecha	anical ve	entilation	without	heat red	covery (MV) (24b	o)m = (2:	2b)m + (23b)	•			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2	24b)
c) If whole he	ouse ex	tract ver	ntilation o	or positiv	e input	ventilati	on from o	outside						
<u> </u>		` 	<u> </u>	´`		- `	4c) = (22k	ŕ	`			1		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2	24c)
d) If natural v							ion from I : 0.5 + [(2		0.51					
(24d)m = 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		(2	24d)
Effective air		rate - er	nter (24a		o) or (24	c) or (2		x (25)	<u> </u>				·	,
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		(2	25)
3. Heat losses	and be	at loss i				-		<u>!</u>	Į.	!		l		
J. Heat losses				Or:										
					Net Ar	ea.	l I-valı	II.E	ΔXII		k-value	2	ΔXk	
ELEMENT	Gros area	SS	paramet Openin m	ıgs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²·ł		A X k kJ/K	
	Gros	SS	Openin	ıgs		m²	W/m2		_	K)			kJ/K	26)
ELEMENT	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K	26) 27)
ELEMENT Doors	Gros area	SS	Openin	ıgs	A ,r	m² x	W/m2	eK = 0.04] =	(W/ 2.736	K)			kJ/K (2	•
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	ıgs	A ,r 2.28 7.55	m ² x x x	W/m2 1.2 1/[1/(1.2)+	= 0.04] = 0.04] =	(W/) 2.736 8.65	K)			kJ/K (2 (2	27)
ELEMENT Doors Windows Type Windows Type	Gros area 1	SS	Openin	ıgs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+	0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38	K)			kJ/K (2 (2 (2	27) 27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1	SS	Openin	ıgs	A ,r 2.28 7.55 8.19 0.55	m² x x x x x	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38 0.63			·	kJ/K (2 (2 (2 (2	27) 27) 27)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights	Gros area 1	ss (m²)	Openin	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2) + 0.14	0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212		kJ/m²·l	`] [kJ/K (2 (2 (2 (2 3667.4 (2	27) 27) 27) 27) 27b)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor	Gros area 1 2 2	ss (m²)	Openin n	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m ²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676		kJ/m²·l	`] [kJ/K (2 (2 (2 (2 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4	27) 27) 27) 27) 27b)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	Gros area 1 2 2 3	68 2	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		410 60		kJ/K (2 (2 (2 (2 (3 6606.6 (2 59.58 (2	27) 27) 27) 27b) 27b) 28)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	Gros area 1 2 2 3 3	68 2 69	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		110 60 9		kJ/K (2 (2 (2 (2 (2 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4	227) 227) 227) 227b) 227b) 228) 229)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1	Gros area 1 2 3 128.6 6.62 25.5	68 2 2 2	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18 0.12	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95		110 60 9		kJ/K (2 (2 (2 (2 (2 (3 (3 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5	227) 227) 227) 227b) 227b) 228) 229) 229)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		kJ/K (2 (2 (2 (2 (2 (3667.4 (2 6606.6 (2 59.58 (2 221.22 (3 55.98 (3 33.48 (3	227) 227) 227) 227b) 227b) 228) 229) 330)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18 0.12 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		kJ/K (2 (2 (2 (2 (2 (3667.4 (2 6606.6 (2 59.58 (2 221.22 (3 33.48 (3 (3	227) 227) 227) 227b) 227b) 228) 229) 330) 330)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type2 Roof Type2 Roof Type3 Total area of elements	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18 0.12 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		kJ/K (2 (2 (2 (2 (2 (3667.4 (2 6606.6 (2 59.58 (2 221.22 (3 33.48 (3 (3 1766.7 (3	227) 227) 227) 227b) 227b) 228) 229) 330) 330) 331)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of elements	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18 0.12 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9		kJ/K (2 (2 (2 (2 (2 (3 6606.6 (2 59.58 (2 221.22 (3 55.98 (3 33.48 (3 1766.7 (3 859.5 (3	227) 227) 227) 227b) 227b) 228) 229) 230) 330) 330) 331)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of elements Party wall Internal wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22 3.77 Ilements	68 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18 0.12 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9 9		kJ/K (2 (2 (2 (2 (2 (3 6606.6 (2 59.58 (3 55.98 (3 33.48 (3 1766.7 (3 859.5 (3 1021.32 (3	227) 227) 227b) 227b) 228) 229) 330) 330) 331) 332)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of elements Party wall Internal wall ** Internal floor	Gros area 1	68 2 2 2 2 , m ²	Openin m 18.5 0 1.01 0 0	ngs 7	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26 95.5 56.74 alue calcul	m²	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 1/[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62 0.34		110 60 9 9 9 9 18 9		kJ/K (2 (2 (2 (2 (2 (3667.4 (2 6606.6 (2 59.58 (3 55.98 (3 33.48 (3 1766.7 (3 859.5 (3	227) 227) 227) 227b) 227b) 228) 229) 330) 330) 331) 332c) 332d)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

52.14

(33)

Heat capacity Cm :	= S(A x k)						((28)	.(30) + (32	?) + (32a).	(32e) =	14802.44	(34)
Thermal mass para	meter (TMF	⊃ = Cm ÷	÷ TFA) ir	ı kJ/m²K			= (34)	÷ (4) =			164.33	(35)
For design assessment	s where the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	10 1.00	
Thermal bridges : S	S (L x Y) cal	culated i	using Ap	pendix I	Κ						17.27	(36)
if details of thermal brid	ging are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric heat los	SS						(33) +	(36) =			69.41	(37)
Ventilation heat los	s calculated	monthly	у				(38)m	= 0.33 × (25)m x (5)			
Jan Fo	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 45.62 45.	28 44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer coeffi	cient, W/K						(39)m	= (37) + (3	38)m			
(39)m= 115.03 114	69 114.35	112.77	112.48	111.1	111.1	110.85	111.63	112.48	113.08	113.7		
Heat loss paramete	er (HLP), W	/m²K						Average = = (39)m ÷	` '	12 /12=	112.77	(39)
(40)m= 1.28 1.2	7 1.27	1.25	1.25	1.23	1.23	1.23	1.24	1.25	1.26	1.26		
Number of days in	month (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.25	(40)
Jan F	eb 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 6	energy requi	irement:								kWh/ye	ear:	
Assumed occupant if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres	= 1 + 1.76 x = 1 t water usag age hot water	ge in litre	es per da 5% if the d	ay Vd,av welling is	erage = designed t	(25 x N)	+ 36		9)	.59		(42)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres	= 1 + 1.76 x = 1 t water usag age hot water per person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target of	9) 96	.59		` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual averant more that 125 litres	= 1 + 1.76 x = 1 t water usage rage hot water per person per eb Mar	ge in litre usage by s day (all w	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36		9)			` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d rater use, f May Vd,m = fac	ay Vd,av welling is not and co Jun ctor from	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43)	+ 36 a water us Sep	ce target of	9) 96 Nov	.59		` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual averant more that 125 litres	= 1 + 1.76 x = 1 t water usagage hot water per person per eb Mar	ge in litre usage by s day (all w	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us Sep	Oct 98.52	9) 96 Nov 102.38	.59 Dec 106.25	1159.04	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, t May Vd,m = fac 90.79	ay Vd,av welling is not and co. Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Sui	9) Nov 102.38 m(44) ₁₁₂ =	.59 Dec 106.25	1159.04	` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, t May Vd,m = fac 90.79	ay Vd,av welling is not and co. Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Sui	9) Nov 102.38 m(44) ₁₁₂ =	.59 Dec 106.25	1159.04	(43)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52 ater used - cal	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,av welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52 ater used - cal	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,av welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Total = Sun th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water hou wa	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52 ater used - cal 8 142.2 eating at point	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,av welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Total = Sun th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water house (46)m= 23.63 20. Water storage loss	= 1 + 1.76 x = 1 t water usage hot water per person per be Mar sper day for each and spe	ge in litre usage by s day (all w Apr ach month 94.66 culated mo 123.97	es per da 5% if the d vater use, h May Vd,m = fac 90.79	y Vd,av lwelling is not and co. Jun ctor from 7 86.93 190 x Vd,r 102.65	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79 77m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur th (see Ta 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water hou water storage loss Storage volume (lit	= 1 + 1.76 x = 1 t water usage hot water per person per sper day for each sper day for each sper used - calculater used - calculater used - calculater used sper day for each specific for each sper day for each sper day for each sper day for each specific for each	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 plar or W	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 x storage), 15.4	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur th (see Ta 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water house (46)m= 23.63 20. Water storage loss	et used - cal ater used - cal	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so	es per da 5% if the d vater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water h (46)m= 23.63 20. Water storage loss Storage volume (lit If community heatin Otherwise if no sto	= 1 + 1.76 x = 1 t water usage hot water per person per	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so ank in dw er (this in	es per da 5% if the d rater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water hou water storage loss Storage volume (little community heating otherwise if no sto water storage loss Water storage loss Water storage loss	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar sper day for ea 38 98.52 ater used - cal 142.2 eating at point 67 21.33 res) includiring and no taled hot water is declared I	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and in dw er (this in	es per da 5% if the d rater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water h (46)m= 23.63 20. Water storage loss Storage volume (lit If community heatin Otherwise if no sto Water storage loss a) If manufacturer	et water usage hot water per person per eb Mar sper day for ea as 98.52 ater used - cal seating at point eas includiring and no tared hot water seater water storage ater storage	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no 18.6 ank in dw er (this in oss factor 2b	es per da 5% if the d rater use, f May Vd,m = far 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W relling, e includes in or is knowear	y Vd,av welling is not and co. Jun etor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage 0 litres in neous con/day):	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)

Hot water storage loss factor from Table 2 (kWh/litre/day)												0		(51)
If community heating see section 4.3											1			
Volume factor from Table 2a Temperature factor from Table 2b											-	0		(52)
·										'E2\ -		0]	(53)
3, 111 1 111 111) X (52) X ((53) =	-	0		(54) (55)
Enter (50) or (54) in (55)											U		(55)	
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$									1			1	(50)	
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										liv H	(56)			
-					1						•		1	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	y circuit l	•	•									0		(58)
	y circuit l				,	,	,	` ,		41	-4-4\			
•	dified by t			1	1					1		_	1	(59)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(39)
Combi	loss calc	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m		,	,		•	
(61)m=	50.96	46.03	50.2	46.68	46.27	42.87	44.3	46.27	46.68	50.2	49.32	50.96		(61)
Total h	eat requi	ired 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=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		(62)
Solar DI	HW input ca	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	ır contribut	ion to wate	er heating)		
(add a	dditional	lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix ()				•	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	110.33	100.81	101.04	91.82	62.31	3.19	2.99	3.34	3.37	93.58	101.01	108.85		(63) (G2)
Output	from wa	ter hea	ter											
	- HOIII Wa	101 1104	lC1					•					•	
(64)m=	98.19	83.02	91.37	78.84	102.91	142.33	136.42	152.08	153.77	85.35	88.82	94.69		٦
	98.19	83.02	91.37					Outp	out from w	ater heate	I r (annual)₁	12	1307.78	(64)
Heat g	98.19	83.02	91.37	kWh/m	onth 0.2	5 ′ [0.85		Outp	out from w	ater heate	I r (annual)₁	12		_
Heat g	98.19	83.02	91.37	kWh/m		5 ′ [0.85		Outp	out from w	ater heate	I r (annual)₁	12		(64) (65)
Heat g (65)m=	98.19	83.02 n water 57.33	91.37 heating, 59.83	kWh/mo	onth 0.2: 51.12	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu	98.19 ains from 65.13	83.02 n water 57.33 n in calc	91.37 heating, 59.83 culation of	kWh/mo 52.89 of (65)m	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu 5. Int	98.19 ains from 65.13 ade (57)m	83.02 n water 57.33 n in calc	91.37 heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu 5. Int	98.19 ains from 65.13 ide (57)m ernal gai	83.02 n water 57.33 n in calc	91.37 heating, 59.83 culation of	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu 5. Int	98.19 ains from 65.13 ade (57)m ternal gai olic gains Jan	83.02 n water 57.33 n in calc ins (see	91.37 heating, 59.83 culation of Table 5	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.2: 51.12 only if c	5 ´ [0.85 44.85 ylinder is	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling	out from w 1] + 0.8 x 48.4 or hot w	ater heate x [(46)m 55.35 vater is fr	+ (57)m 59.05	+ (59)m 63.48 munity h]	_
Heat g (65)m= inclu 5. Int Metabo (66)m=	98.19 ains from 65.13 ade (57)m ternal gai olic gains Jan	83.02 n water 57.33 n in calcons (see Example 131.34	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.23 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heate x [(46)m 55.35 vater is fr	+ (57)m + (57)m 59.05 rom com	+ (59)m 63.48 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m=	98.19 ains from 65.13 ide (57)m ernal gai olic gains Jan 131.34	83.02 n water 57.33 n in calcons (see Example 131.34	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.23 51.12 only if co): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heate x [(46)m 55.35 vater is fr	+ (57)m + (57)m 59.05 rom com	+ (59)m 63.48 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	98.19 ains from 65.13 de (57)m cernal gai colic gains Jan 131.34 g gains (n water 57.33 n in calcons (see 5 (Table Feb 131.34 calculat 19.14	91.37 heating, 59.83 culation of the Table 5 5), Wat Mar 131.34 ted in Ap 15.56	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if c): May 131.34 L, equat	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heate x [(46)m 55.35 vater is fr Oct 131.34	+ (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	ains from 65.13 Ide (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair	n water 57.33 n in calcons (see 5 (Table Feb 131.34 calculat 19.14	91.37 heating, 59.83 culation of the Table 5 5), Wat Mar 131.34 ted in Ap 15.56	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.2: 51.12 only if c): May 131.34 L, equat	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heate x [(46)m 55.35 vater is fr Oct 131.34	+ (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ains from 65.13 Ide (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair	83.02 n water 57.33 n in calc ins (see Feb 131.34 calcular 19.14 ns (calc 241.71	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Appendix 222.13	onth 0.2: 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair 239.22	83.02 n water 57.33 n in calc ins (see Feb 131.34 calcular 19.14 ns (calc 241.71	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Appendix 222.13	onth 0.2: 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m=	ains from 65.13 Ide (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair 239.22 ng gains (83.02 n water 57.33 n in calc ns (see 8 (Table Feb 131.34 calcular 19.14 ns (calcular 241.71 (calcular 36.13	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in Ap 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair 239.22 ng gains (36.13	83.02 n water 57.33 n in calc ns (see 8 (Table Feb 131.34 calcular 19.14 ns (calcular 241.71 (calcular 36.13	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in Ap 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 182.74 ee Table	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair 239.22 ng gains (36.13 and fans	83.02 n water 57.33 n in calcons (see 15) 131.34 calcular 19.14 ns (calcular 241.71 (calcular 36.13 s gains 3	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in Ap 235.45 ted in Ap 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Appendix 222.13 opendix 36.13	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m=	ains from 65.13 Ide (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (36.13 a and fans	83.02 n water 57.33 n in calcons (see Feb 131.34 calculated 19.14 ns (calculated 19.14 ns (calculated 19.14) s gains 3 aporation	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in Ap 235.45 ted in Ap 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Appendix 222.13 opendix 36.13	onth 0.23 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair 239.22 ng gains (36.13 and fans 3 s e.g. eva	83.02 n water 57.33 n in calc ins (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcular 36.13 s gains 3 aporatio -105.07	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in Ap 36.13 (Table 5 3 n (negation of the control of the co	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3	onth 0.25 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gair 239.22 ng gains (36.13 and fans 3 s e.g. eva -105.07	83.02 n water 57.33 n in calc ins (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcular 36.13 s gains 3 aporatio -105.07	91.37 heating, 59.83 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in Ap 36.13 (Table 5 3 n (negation of the control of the co	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 3	onth 0.25 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$														
(73)m= 413.71 411.	55 396.84	372.78	348.24	32	4.65	309.8	316	.66	329.38	353.60	381.06	401.53		(73)
6. Solar gains:									,					
Solar gains are calcula	ted using sola	ar flux from	n Table 6a	and	associ	ated equa	tions	to co	nvert to the	applic	able orientat	ion.		
Orientation: Acces		Area	ì		Flux			_	g_ 		FF Table 0		Gains	
Table	60 	m²		_	ı ac	le 6a			able 6b	_	Table 6c		(W)	
	.77 ×	8.	19	x	3	6.79	X		0.63	X	0.7	=	92.09	(77)
Southeast 0.9x	.77 ×	8.	19	X	6	2.67	X		0.63	X	0.7	=	156.87	(77)
	.77 ×	8.	19	x	8	5.75	X		0.63	×	0.7	=	214.64	(77)
	.77 ×	8.	19	X	10	6.25	X		0.63	X	0.7	=	265.94	(77)
Southeast 0.9x 0	.77 ×	8.	19	X	11	9.01	X		0.63	X	0.7	=	297.88	(77)
	.77 ×	8.	19	X	11	8.15	X		0.63	X	0.7	=	295.73	(77)
	.77 ×	8.	19	X	11	3.91	X		0.63	X	0.7	=	285.11	(77)
	.77 ×	8.	19	X	10	4.39	X		0.63	X	0.7	=	261.29	(77)
	.77 ×	8.	19	x	9:	2.85	X		0.63	×	0.7	=	232.41	(77)
	.77 ×	8.	19	X	6	9.27	X		0.63	X	0.7	=	173.37	(77)
Southeast 0.9x 0	.77 ×	8.	19	x	4	4.07	X		0.63	×	0.7	=	110.31	(77)
Southeast 0.9x 0	.77 ×	8.	19	x	3	1.49	X		0.63	×	0.7	=	78.81	(77)
Southwest _{0.9x} 0	.77 ×	0.	55	x	3	6.79			0.63	X	0.7	=	6.18	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	x	6	2.67			0.63	×	0.7	=	10.53	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	X	8	5.75			0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	x	10	6.25			0.63	X	0.7	=	17.86	(79)
	.77 ×	0.	55	x	11	9.01			0.63	X	0.7	=	20	(79)
	.77 ×	0.	55	x	11	8.15			0.63	×	0.7	=	19.86	(79)
	.77 ×	0.	55	x	11	3.91			0.63	×	0.7	=	19.15	(79)
	.77 ×	0.	55	x	10	4.39			0.63	X	0.7	=	17.55	(79)
	.77 ×	0.	55	X	9:	2.85			0.63	X	0.7	=	15.61	(79)
	.77 ×	0.	55	x	6	9.27			0.63	×	0.7	=	11.64	(79)
	.77 ×	0.	55	x	4	4.07			0.63	×	0.7	=	7.41	(79)
	.77 ×	0.	55	x	3	1.49			0.63	×	0.7	=	5.29	(79)
	.77 ×	7.	55	X	1	1.28	X		0.63	X	0.7	=	26.03	(81)
	.77 ×	7.	55	x	2:	2.97	X		0.63	×	0.7	=	52.99	(81)
	.77 ×	7.	55	x	4	1.38	X		0.63	×	0.7	=	95.48	(81)
	.77 ×	7.	55	x	6	7.96	X		0.63	X	0.7	=	156.8	(81)
	.77 ×	7.	55	x	9	1.35	X		0.63	X	0.7	=	210.77	(81)
	.77 ×	7.	55	x	9	7.38	x		0.63	X	0.7	=	224.7	(81)
	.77 ×	7.	55	x	9	1.1	x		0.63	X	0.7	=	210.2	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	7:	2.63	x		0.63	X	0.7	=	167.58	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	5	0.42	x		0.63	X	0.7	=	116.34	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	2	3.07	X		0.63	X	0.7	=	64.76	(81)

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x	0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x	0.63	x [0.7	=	21.26	(81)
Rooflights 0.9x	1	X	1.0)1	x	16.37	x	0.63	x [0.7		6.56	(82)
Rooflights 0.9x	1	X	1.0)1	x	33.68	x	0.63	x	0.7	=	13.5	(82)
Rooflights 0.9x	1	X	1.0)1	x	62.13	x	0.63	x [0.7		24.91	(82)
Rooflights 0.9x	1	x	1.0)1	x ·	104.87	×	0.63	×	0.7	=	42.04	(82)
Rooflights 0.9x	1	x	1.0)1	X	143.66	x	0.63	×	0.7	=	57.59	(82)
Rooflights 0.9x	1	x	1.0)1	X ·	154.33	x	0.63	x	0.7	-	61.87	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.9	×	0.63	×	0.7	=	57.69	(82)
Rooflights 0.9x	1	x	1.0)1	X ·	113.05	x	0.63	x	0.7	-	45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	×	0.63	x	0.7		30.69	(82)
Rooflights 0.9x	1	x	1.0)1	X	41.49	x	0.63	x	0.7		16.63	(82)
Rooflights 0.9x	1	X	1.0)1	x	20.65	×	0.63	x	0.7	_	8.28	(82)
Rooflights 0.9x	1	x	1.0)1	x	13.34	x	0.63	x	0.7	-	5.35	(82)
							_						
Solar gains i	n watts, ca	alculated	for eacl	h month			(83)m =	= Sum(74)m .	(82)m			-	
(83)m= 130.8		349.43	482.64	586.24	602.16		491.7	395.04	266.41	158.75	110.71		(83)
Total gains –	1			` ´ 	<u> </u>	·	1					1	
(84)m= 544.59	9 645.45	746.27	855.42	934.48	926.81	881.95	808.3	724.42	620.07	539.81	512.25		(84)
7. Mean inte	ernal temp	perature ((heating	season)								
Temperatur	e during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)													
Utilisation fa	actor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)		. ,					
Utilisation fa		ains for I Mar	iving are Apr	ea, h1,m May	(see Ta	able 9a) Jul	Au		Oct	Nov	Dec		
					<u> </u>	1	Au 0.58	g Sep	Oct 0.94	Nov 0.98	Dec 0.99		(86)
(86)m= Jan 0.99	Feb 0.98	Mar 0.96	Apr 0.91	May 0.82	Jun 0.66	Jul 0.52	0.58	g Sep 0.8		_			(86)
Jan	Feb 0.98	Mar 0.96	Apr 0.91	May 0.82	Jun 0.66	Jul 0.52	0.58	g Sep 0.8 able 9c)		_			(86)
(86)m= 0.99 Mean intern (87)m= 19.08	0.98 all temper	0.96 ature in 1	Apr 0.91 living are 20.19	May 0.82 ea T1 (fo 20.6	Jun 0.66 ollow ste 20.87	Jul 0.52 eps 3 to 7	0.58 7 in Ta 20.9	g Sep 0.8 able 9c) 4 20.73	0.94	0.98	0.99		
(86)m= 0.99 Mean intern	Feb 0.98 nal temper 19.32 re during h	0.96 ature in 1	Apr 0.91 living are 20.19	May 0.82 ea T1 (fo 20.6	Jun 0.66 ollow ste 20.87	Jul 0.52 eps 3 to 7	0.58 7 in Ta 20.9	g Sep 0.8 able 9c) 4 20.73 Th2 (°C)	0.94	0.98	0.99		
(86)m= 0.99 Mean intern (87)m= 19.08 Temperatur (88)m= 19.86	Feb 0.98 all temper 19.32 e during h	Mar 0.96 rature in l 19.69 neating p	Apr 0.91 living are 20.19 eriods ir 19.88	May 0.82 ea T1 (for 20.6 n rest of 19.88	Jun 0.66 Dillow ste 20.87 dwelling 19.89	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89	0.58 7 in Ta 20.94 able 9,	g Sep 0.8 able 9c) 4 20.73 Th2 (°C)	0.94	0.98	0.99 19.05		(87)
Jan (86)m= 0.99	Feb 0.98 all temper 19.32 e during here 19.86 actor for g	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r	Apr 0.91 living are 20.19 eriods ir 19.88	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling,	Jun 0.66 bllow ste 20.87 dwelling 19.89 h2,m (s	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table	0.58 7 in Ta 20.94 able 9, 19.9 9a)	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89	0.94 20.18 19.88	0.98 19.55 19.88	0.99 19.05		(87)
Jan 0.99	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89	0.94 20.18 19.88	0.98	0.99 19.05		(87)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper	Mar 0.96 eature in language in 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelli	Jun 0.66 bllow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste	0.587 in Ta 20.94 able 9, 19.9 9a) 0.46	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 1 19.89 0.73 to 7 in Table	0.94 20.18 19.88 0.92 e 9c)	0.98 19.55 19.88 0.98	0.99 19.05 19.87		(87) (88) (89)
Jan 0.99	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Table 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99		(87) (88) (89) (90)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper	Mar 0.96 eature in language in 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelli	Jun 0.66 bllow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste	0.587 in Ta 20.94 able 9, 19.9 9a) 0.46	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Table 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99	0.27	(87) (88) (89)
Jan	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47	Jun 0.66 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 to 7 in Tabl 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47	Jun 0.66 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Tabl 6 19.65 f	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to the	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2 ature (fo	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91 r the wh	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78	Jun 0.66 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (f 19.79	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87 fLA × T1 20.17	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t 19.86 + (1 - 20.10	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.73 0.73 10.73 10.74 119.65 f -fLA) × T2 6 19.94	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4	0.99 19.05 19.87 0.99 17.27 4) =	0.27	(87) (88) (89) (90) (91) (92)
Jan 0.99	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66 al temper 18.11 tment to t 17.96	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2 ature (fo 18.61 he mean	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91 r the wh	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78	Jun 0.66 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (f 19.79	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87 fLA × T1 20.17	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t 19.86 + (1 - 20.10	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Tabl 6 19.65 f -fLA) × T2 6 19.94 where approximation in the second content of	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4	0.99 19.05 19.87 0.99 17.27 4) =	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to	Mar 0.96 eature in language in 19.86 ains for rature in tale 18.2 eature (for 18.61) he mean 18.46 uirement	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelli 19.47 cole dwe 19.78 I temper 19.63	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 1 20.08 ature fro 19.93	Jul	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t 19.86 + (1 - 20.16 e 4e, w 20.0	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Tabl 6 19.65 f 19.94 there approx	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4) 18.43	0.99 19.05 19.87 0.99 17.27 1) =		(87) (88) (89) (90) (91) (92)
Jan	Feb 0.98 19.32 e during h 19.86 actor for g 0.98 al temper 17.66 al temper 18.11 tment to	Mar 0.96 ature in 1 19.69 19.86 ains for r 0.95 ature in 1 18.2 ature (fo 18.61 he mean 18.46 uirement ternal ternal ternal	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78 I temper 19.63	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 1 20.08 ature fro 19.93	Jul	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t 19.86 + (1 - 20.16 e 4e, w 20.0	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Tabl 6 19.65 f 19.94 there approx	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4) 18.43	0.99 19.05 19.87 0.99 17.27 1) =		(87) (88) (89) (90) (91) (92)
Mean intern (92)m= 17.85 Mean intern (93)m= 17.65 Set Ti to the the utilisation for the utilisation for the formula (93)m for the utilisation fo	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66 al temper 18.11 tment to to to to feet in factor for general interper e mean interper for general interper general interpe	Mar 0.96 ature in langer of the mean 18.46 auture in the mean 18.46 uirement ternal terror gains to	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11 mperaturusing Ta	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78 I temper 19.63 re obtain able 9a	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 1 20.08 ature fro 19.93	Jul	0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 t 19.8 + (1 - 20.1 e 4e, w 20.0 Table	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 To 7 in Table 6 19.65 f -fLA) × T2 6 19.94 where approx 1 19.79	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11 t Ti,m=	0.98 19.55 19.88 0.98 18.01 18.43 18.28 (76)m and	0.99 19.05 19.87 0.99 17.27 4) = 17.76 17.61 d re-cald		(87) (88) (89) (90) (91) (92)
Mean intern (86)m= 19.08 Temperatur (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean intern (90)m= 17.32 Mean intern (92)m= 17.8 Apply adjus (93)m= 17.65 8. Space he Set Ti to the the utilisation Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to to to for general interper e mean interper for for general interper Feb	Mar 0.96 ature in langle	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11 mperaturusing Ta Apr	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78 I temper 19.63	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 1 20.08 ature fro 19.93	Jul	0.58 7 in Ta 20.94 able 9, 19.9 9a) 0.46 eps 3 t 19.86 + (1 - 20.16 e 4e, w 20.0	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 To 7 in Table 6 19.65 f -fLA) × T2 6 19.94 where approx 1 19.79	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4) 18.43	0.99 19.05 19.87 0.99 17.27 1) =		(87) (88) (89) (90) (91) (92)
Mean intern (92)m= 17.85 Mean intern (93)m= 17.65 Set Ti to the the utilisation for the utilisation for the formula (93)m for the utilisation fo	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to to to for general interper e mean interper for for general interper Feb	Mar 0.96 ature in langle	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11 mperaturusing Ta Apr	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78 I temper 19.63 re obtain able 9a	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 1 20.08 ature fro 19.93	Jul	0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 t 19.8 + (1 - 20.1 e 4e, w 20.0 Table	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89 0.73 0.7 in Tabl 6 19.65 f -fLA) × T2 6 19.94 vhere appro 1 19.79 e 9b, so that	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11 t Ti,m=	0.98 19.55 19.88 0.98 18.01 18.43 18.28 (76)m and	0.99 19.05 19.87 0.99 17.27 4) = 17.76 17.61 d re-cald		(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m			
(95)m= 533.93 623.75 699.72 746.97 706.62 540.06 367.83 381.4 523.28 562.66 522.61	503.94		(95)
Monthly average external temperature from Table 8	4.0		(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 1535.61 1497.79 1367.68 1151.11 891.75 592.45 379.75 399.69 635.52 957.67 1263.78	1524.49		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	1324.49		(37)
(98)m= 745.25 587.35 496.96 290.98 137.74 0 0 0 0 293.89 533.64	759.29		
Total per year (kWh/year) = Sum(98		3845.1	(98)
	//15,912]
Space heating requirement in kWh/m²/year	Į	42.69	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)			
Space heating:	Г		1,,,,,
Fraction of space heat from secondary/supplementary system	ļ	0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$	ļ	1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		1	(204)
Efficiency of main space heating system 1		90.4	(206)
Efficiency of secondary/supplementary heating system, %	Ī	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec	kWh/yea	ır
Space heating requirement (calculated above)		,	
745.25 587.35 496.96 290.98 137.74 0 0 0 0 293.89 533.64	759.29		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)			(211)
824.39 649.73 549.74 321.88 152.36 0 0 0 0 325.1 590.31	839.92		
Total (kWh/year) =Sum(211) _{15,1012}	:	4253.43	(211)
Space heating fuel (secondary), kWh/month			_
= {[(98)m x (201)] } x 100 ÷ (208)			
(215)m= 0 0 0 0 0 0 0 0 0 0 0	0		
Total (kWh/year) =Sum(215) _{15,1012} =	:	0	(215)
Water heating			
Output from water heater (calculated above)			
98.19 83.02 91.37 78.84 102.91 142.33 136.42 152.08 153.77 85.35 88.82	94.69		7
Efficiency of water heater		80.3	(216)
(217)m= 89.1 89.01 88.67 88.04 85.79 80.3 80.3 80.3 87.91 88.81	89.16		(217)
Fuel for water heating, kWh/month			
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 110.21 93.27 103.04 89.55 119.97 177.24 169.89 189.39 191.49 97.08 100.02 $	106.21		
Total = Sum(219a) _{1,-12} =		1547.35	(219)
Annual totals kWh/year	L	kWh/year	(= 10)
Space heating fuel used, main system 1	[4253.43]
Water heating fuel used	[1547.35]
-	L	10.17.00	J
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 o	of (230a)(230g) =	75 (231)
Electricity for lighting		380.53 (232)	
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =	•	6256.31 (338)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	918.74 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	334.23 (264)
Space and water heating	(261) + (262) + (263) + (263)	64) =	1252.97 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519	197.49 (268)
Total CO2, kg/year		sum of (265)(271) =	1489.39 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	16.53 (273)

El rating (section 14)

(274)

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Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Mid-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -BASE

Plot Reference: Sample 2

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.63 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.62 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.8 kWh/m²

ОК

2 Fabric U-values

Element Highest **Average** External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 %

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

OK

6 Controls

Space heating controls TTZC by plumbing and electrical services

No cylinder thermostat

No cylinder

Boiler interlock: Yes OK

7 Low energy lights

Hot water controls:

Percentage of fixed lights with low-energy fittings 100.0%

Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Medium

Based on:

Overshading: Average or unknown

Windows facing: North West
7.55m²
Windows facing: South East
8.19m²
Windows facing: South West
Roof windows facing: North West
1.01m²
Ventilation rate:
4.00

10 Key features

Roofs U-value 0.12 W/m²K
Party Walls U-value 0 W/m²K

OK

OK

		User	Details:						
Assessor Name:	Neil Ingham		Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 2012			are Ve			Versio	n: 1.0.5.41	
A 11		Property	Address	: Sample	e 2				
Address: 1. Overall dwelling dimer	nsions:								
1. Overall awelling alline	noiche.	Ar	ea(m²)		Av. Hei	ight(m)		Volume(m³)	
Ground floor			33.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			33.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor			23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	(1n)	90.08	(4)				<u> </u>	_
Dwelling volume		<u> </u>		(3a)+(3b)+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:									
	main sec heating hea	ondary ating	other		total			m³ per houi	r
Number of chimneys	0 +	0 +	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0		0	x	20 =	0	(6b)
Number of intermittent far	ns				3	x	10 =	30	(7a)
Number of passive vents				Ē	0	x	10 =	0	(7b)
Number of flueless gas fir	res			F	0	x -	40 =	0	(7c)
				_				_	
				_				anges per ho	_
Infiltration due to chimney	rs, flues and fans = (6a)+ een carried out or is intended,			continue fr	30		÷ (5) =	0.13	(8)
Number of storeys in th		proceed to (17)	, otherwise (continue n	om (9) to (10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber fra	me or 0.35 f	or mason	ry constr	ruction			0	(11)
if both types of wall are pro deducting areas of opening	esent, use the value correspon	nding to the gre	ater wall are	a (after					_
	oor, enter 0.2 (unsealed	l) or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic	metres per h	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	•							0.38	(18)
Air permeability value applies Number of sides sheltered	s if a pressurisation test has be	een done or a d	egree air pe	rmeability	is being us	sed	ı	0	7(10)
Shelter factor	u		(20) = 1 -	[0.075 x (1	19)] =			1	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18) x (20) =				0.38	(21)
Infiltration rate modified for	-								
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		

Wind Factor (22a\m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
	·						(0.4.)	(00.)				1	
Adjusted infilt	ration rat	e (allow 0.47	ing for st	nelter an _{0.41}	d wind s	peed) 0.37	= (21a) x	(22a)m _{0.38}	0.41	0.43	0.45	1	
Calculate effe							0.30	0.36	0.41	0.43	0.45	J	
If mechanic	al ventila	ition:										0 ((23a)
If exhaust air h	eat pump i	using App	endix N, (2	(23a) = (23a	a) × Fmv (e	equation	(N5)) , othe	rwise (23b	o) = (23a)			0	(23b)
If balanced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fro	om Table 4h) =				0	(23c)
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (M\	/HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)	· -	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0] ((24a)
b) If balance	1		1				` 	ŕ	<u> </u>			1 .	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h				•	•				E v (22h	. \			
(24c)m = 0	0.5 ×	(230),	nen (240	$\frac{(230)}{0}$			$\frac{4c}{1} = \frac{(22b)}{0}$) iii + 0	.5 × (231	0	0	1 ((24c)
(1)										U] `	(2.0)
d) If natural if (22b)ı							: 0.5 + [(2		0.5]				
(24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6] ((24d)
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (2	24d) in box	x (25)				•	
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		(25)
3. Heat losse	مطالم من من												
J. 1 leat 10556	es and ne	eat loss i	paramet	er:									
ELEMENT	Gros area	ss	paramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	<)	k-value kJ/m²·l		(
	Gros	ss	Openin	gs		n²	W/m2			<) 		K kJ/K	(26)
ELEMENT	Gros area	ss	Openin	gs	A ,r	m²	W/m2	2K =	(W/I	<) 		K kJ/K	
ELEMENT Doors	Gros area e 1	ss	Openin	gs	A ,r	m² ×	W/m2	eK = 0.04] =	(W/l	<) 		K kJ/K ((26)
ELEMENT Doors Windows Type	Gros area e 1 e 2	ss	Openin	gs	A ,r 2.28 7.55	m² ×	W/m2 1.2 (1/[1/(1.2)+	= 0.04] = 0.04] =	(W/l 2.736 8.65	<) 		K kJ/K (((26) (27)
Doors Windows Type Windows Type	Gros area e 1 e 2	ss	Openin	gs	A ,r 2.28 7.55 8.19	m² ×	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38	<) 		K kJ/K ((26) (27) (27)
Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2	ss	Openin	gs	A ,r 2.28 7.55 8.19 0.55	m² ×	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38 0.63			K kJ/K ((26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Rooflights	Gros area e 1 e 2	ss (m²)	Openin	gs ²	A ,r 2.28 7.55 8.19 0.55 1.01	m²	W/m2 (1.2 (1/[1/(1.2)+ (0.04] = 0.04] = 0.04] = 0.04] =	(W/l 2.736 8.65 9.38 0.63 1.212		kJ/m²·l	K kJ/K ((26) (27) (27) (27) (27b)
Doors Windows Type Windows Type Windows Type Rooflights Floor	Gros area e 1 e 2 e 3	ss (m²)	Openin n	gs ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676		kJ/m²·l	K kJ/K ((((((((((((((((((((26) (27) (27) (27) (27) (27b)
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81	m²	W/m2 (1.2) (1/[1/(1.2)+ (1/[1/[1/(1.2)+ (1/[1/[1/(1.2)+ (1/[1/[1/(1.2)+ (1/[1/[1/(1.2)+ (1/[1/[1/[1/(1.2)+ (1/[1/[1/[1/[1/[1/[1/[1/[1/[1/[1/[1/[1/[1	2K = 0.04] = 0.04] = 0.04] = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93		110 60	K kJ/K ((((((((((((((((((((26) (27) (27) (27) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62	m²	W/m2 (1.2) (1/[1/(1.2)+(1/[1/(1.2)+ (1/[1/(1.2)+(1/[1/(1.2)+(1/[1/(1.2)+(1/[1/(1.2)+(1/[1/(1.2)+(1/[1/(1.2)+(1/[1/(1.2)+(1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93		110 60 9	K kJ/K ((((((((((((((((((((26) (27) (27) (27) (27b) (28) (29)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1	Gros area e 1 e 2 e 3 90.3 6.66 25.5	88 2 2 2	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58	m²	W/m2 (1.2) (1/[1/(1.2)+ (1/[1/(2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95		110 60 9	K kJ/K ((((((((((((((((((((26) (27) (27) (27) (27b) (28) (29) (29) (30)
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 90.3 6.62 25.5 6.22	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58	m²	W/m2 (1.2) (1/[1/(1.2)+ (1/[1/(2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95		110 60 9 9	K kJ/K (() () () () () () () () () () () () ()	(26) (27) (27) (27) (27b) (28) (29) (29) (30) (30)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of 6	Gros area e 1 e 2 e 3 90.3 6.62 25.5 6.22	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72	m²	W/m2 (1.2) (1/[1/(1.2)+(1.2)+ (1/[1/(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62		110 60 9 9	K kJ/K ((((((((((((((((((((26) (27) (27) (27) (27b) (28) (29) (30) (30) (30) (31)
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22 3.72 elements	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8	m²	W/m2 (1.2) (1/[1/(1.2)+(1.2)+ (1/[1/(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95		110 60 9 9	K kJ/K (() () () () () () () () () () () () ()	(26) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (31) (32)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22 3.72 elements	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8 77.56	m²	W/m2 (1.2) (1/[1/(1.2)+(1.2)+ (1/[1/(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62		110 60 9 9 9 9	K kJ/K (() () () () () () () () () () () () ()	(26) (27) (27) (27) (27b) (28) (29) (30) (30) (30) (31) (32) (32c)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall Internal wall ** Internal floor	Gros area e 1 e 2 e 3 90.3 6.62 3.72 elements	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8	m²	W/m2 (1.2) (1/[1/(1.2)+(1.2)+ (1/[1/(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1.2)+(1	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62		110 60 9 9 9	K kJ/K () () () () () () () () () () () () ()	(26) (27) (27) (27) (27b) (28) (29) (30) (30) (30) (31) (32) (32c) (32d)
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of e Party wall Internal wall **	Gros area e 1 e 2 e 3 90.3 6.62 3.73 elements	88 (m²) 99 2 2 , m²	18.5 0 1.01 0	gs ⁷	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8 77.56 95.5 56.74	m²	W/m2 (1.2) (1/[1/(1.2)+ (1/[1/(EK = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62 0.34		110 60 9 9 9 9 18 9	K kJ/K () () () () () () () () () () () () ()	(26) (27) (27) (27) (27b) (28) (29) (30) (30) (30) (31) (32) (32c)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

45.24

(33)

Heat capacity Cm = S	S(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	14227.94	(34)
Thermal mass param	,	⊃ = Cm ÷	÷ TFA) ir	ı kJ/m²K			= (34)	÷ (4) =			157.95	(35)
For design assessments w	here the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	107.00	(/
can be used instead of a d			uaina An	nondiy l	/						40.00	7(20)
Thermal bridges: S (if details of thermal bridgin	,		• .	•	N.						16.86	(36)
Total fabric heat loss	g are not kir	OWII (30) -	- 0.00 X (3	')			(33) +	(36) =			62.1	(37)
Ventilation heat loss	calculated	d monthly	v					= 0.33 × (25)m x (5)		V <u>-</u>	` ′
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 45.62 45.28	44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer coefficie	ent, W/K	<u> </u>			<u> </u>		(39)m	= (37) + (37)				
(39)m= 107.72 107.38		105.46	105.17	103.79	103.79	103.53	104.32	105.17	105.77	106.39		
Heat loss parameter	HID) W/	/m²K			I			Average = = (39)m ÷	` '	12 /12=	105.46	(39)
(40)m= 1.2 1.19	1.19	1.17	1.17	1.15	1.15	1.15	1.16	1.17	1.17	1.18		
(40)111	1.10	1.17	1.17	1.10	1.10	1.10		Average =			1.17	(40)
Number of days in me	onth (Tab	le 1a)					,	Wordgo	Cum (10)	12 / 12	1.17	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
	-1		<u>I</u>								l	
4. Water heating end	ergy requi	irement:								kWh/ye	ear:	
Assumed occupancy, if TFA > 13.9, N = 3 if TFA £ 13.9, N = 3	l + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.	1	63		(42)
if TFA > 13.9, $N = \frac{1}{2}$	l + 1.76 x l vater usaç e hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed t	(25 x N)	+ 36		9)	.59		(42)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 1 Annual average hot v Reduce the annual average not more that 125 litres per	l + 1.76 x l vater usaç e hot water r person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 96	.59		, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 Annual average hot we Reduce the annual average	I + 1.76 x I Vater usage hot water r person per Mar	ge in litre usage by s day (all w	es per da 5% if the d vater use, I	ay Vd,ave lwelling is a not and con Jun	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36		9)			, ,
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 if TFA £	yater usage hot water r person per Mar er day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	ay Vd,avelling is not and con Jun	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43)	+ 36 a water us Sep	ce target o	9) 96 Nov	.59		, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot w Reduce the annual average not more that 125 litres per	tater usage hot water person per Mar er day for ea	ge in litre usage by s day (all w	es per da 5% if the d vater use, I	ay Vd,ave lwelling is a not and con Jun	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us Sep	Oct	9) 96 Nov	.59 Dec	1159 04	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 if TFA £	t + 1.76 x vater usage hot water r person per Mar er day for ea	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, I May Vd,m = fa 90.79	ay Vd,ave welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Su	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	, ,
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38	t + 1.76 x vater usage hot water r person per Mar er day for ea	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, I May Vd,m = fa 90.79	ay Vd,ave welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Su	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 if TFA £	yater usage hot water r person per Mar er day for ea 98.52	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the da 5% if th	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Suith (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8	yater usage hot water reperson per Mar er day for ear 142.2	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97	es per da 5% if the d vater use, I May Vd,m = fa 90.79 onthly = 4. 118.95	y Vd,ave welling is not and constant from 186.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in	(25 x N) o achieve Aug (43) 90.79 90.79 109.15 boxes (46)	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Suith (see Ta 128.72 Fotal = Suith	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ =	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67	yater usage hot water r person per Mar er day for ea 98.52	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the da 5% if th	y Vd,avi welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Total = Sur th (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8	yater usage hot water reperson per Mar 98.52 er used - calculating at point 21.33	ge in litre usage by s day (all w Apr ach month 94.66 culated mo 123.97	es per da 5% if the director use, If May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84	y Vd,avelwelling is not and constant from 186.93	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79 77m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	98.52 Total = Surth (see Tall 128.72 Total = Sur 119.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss: Storage volume (litres)	yater usage hot water reperson per Mar er day for ear 98.52 rused - calculating at point 21.33	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no	es per da 5% if the da 5% if th	y Vd,avi welling is not and col Jun ctor from 7 86.93 190 x Vd,ri 102.65 x storage), 15.4	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	98.52 Total = Surth (see Tall 128.72 Total = Sur 119.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss:	ter used - calculating at point 21.33	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so	es per da 5% if the d vater use, f May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,avi welling is not and con Jun ctor from 1 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 19.31 19.31	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 if TFA £ 12.9, N = 2 if TFA £ 12.9, N = 2 if TFA £ 12.9, N = 2 if TFA £ 13.9, N = 2 if TFA £	yater usage hot water reperson per Mar er day for ear 98.52 142.2 ting at point 21.33 a) includir and no tall thot water series water and thot water series wa	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so ank in dw er (this in	es per da 5% if the d rater use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,ave welling is not and contained and co	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 19.31 19.31	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 Annual average hot we Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss: Storage volume (litrest of the storage loss: A) If manufacturer's content of the water storage loss: A) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss:	H + 1.76 x Vater usage hot water reperson per Mar er day for ear 98.52 Prused - calc 142.2 ting at point 21.33 s) includir and no talch hot water	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and in dw er (this in	es per da 5% if the d rater use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,ave welling is not and contained and co	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 19.31 19.31	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N = 7 if TFA £ 13.9, N = 7 Annual average hot v Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss: Storage volume (litrest of the storage loss) If community heating Otherwise if no stored water storage loss: a) If manufacturer's of the storage loss: Temperature factor from the storage loss of the storage lo	te table and no tale declared le om Table	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 ank in dw er (this in oss factor 2b	es per da 5% if the d rater use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W relling, e oncludes i	y Vd,ave welling is not and contained and co	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Suith (see Tail 19.31 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = 10bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13.9, N = 1 if TFA £ 13.9, N = 2 Annual average hot we Reduce the annual average not more that 125 litres per Jan Feb Hot water usage in litres per (44)m= 106.25 102.38 Energy content of hot water (45)m= 157.56 137.8 If instantaneous water head (46)m= 23.63 20.67 Water storage loss: Storage volume (litrest of the storage loss: A) If manufacturer's content of the water storage loss: A) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss: a) If manufacturer's content of the storage loss:	ting at point and no taddeclared lear storage 1 + 1.76 x 21.33	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no 18.6 ank in dw er (this in oss factor 2b	es per da 5% if the d rater use, I May Vd,m = far 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W relling, e includes i or is knowear	y Vd,ave welling is not and constant and constant are welling is not and constant are well with the stant are well as th	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage 0 litres in neous con/day):	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Suith (see Tail 19.31 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89 0		(43) (44) (45) (46) (47)

Hot water storage loss factor from Table 2 (kWh/litre/day)	')					0		(51)
If community heating see section 4.3								1	
Volume factor from Table 2a Temperature factor from Table 2b						-	0	•	(52)
·		,	47) (54)	(50) (E0)		0		(53)
Energy lost from water storage, kWh/year Enter (50) or (54) in (55)		(4	47) x (51)	x (52) x (53) =	-	0		(54) (55)
Water storage loss calculated for each mon	th	(1	(56)m = (5	55) v (41)	m		0		(55)
			·		1	_	_	1	(50)
(56) m= $\begin{bmatrix} 0 & 0 & 0 & 0 \\ & 0 & & 0 \end{bmatrix}$ If cylinder contains dedicated solar storage, (57) m = (57) m	0 6)m x [(50) — (H1	0 11)] ÷ (50)	0) else (57	0 7)m = (56)	0 m where (0 H11) is fro	0 m Annend	liv H	(56)
								1	()
(57)m= 0 0 0 0 0	0	0	0	0	0	0	0		(57)
Primary circuit loss (annual) from Table 3							0		(58)
Primary circuit loss calculated for each mon	, , ,	•	, ,						
(modified by factor from Table H5 if there								1	(50)
(59)m= 0 0 0 0 0	0	0	0	0	0	0	0		(59)
Combi loss calculated for each month (61)n	n = (60) ÷ 365	5 × (41)r	m						
(61)m= 50.96 46.03 50.2 46.68 46.	27 42.87	44.3	46.27	46.68	50.2	49.32	50.96		(61)
Total heat required for water heating calcula	ited for each	month ((62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 208.52 183.83 192.4 170.65 165	22 145.52	139.42	155.42	157.13	178.93	189.83	203.55		(62)
Solar DHW input calculated using Appendix G or Appe	ndix H (negative	e quantity)	(enter '0'	if no sola	r contributi	on to wate	er heating)		
(add additional lines if FGHRS and/or WWH	RS applies, s	see App	endix G	6)					
(63)m= 0 0 0 0	0	0	0	0	0	0	0		(63)
FHRS 109.24 100.07 100.28 91.39 52.9	3.19	2.99	3.34	3.37	93.16	100.31	107.81		(63) (G2)
Output from water heater									
								_	
(64)m= 99.28 83.76 92.12 79.27 112	31 142.33	136.42	152.08	153.77	85.77	89.52	95.74		_
·	31 142.33	136.42			85.77 ater heater		L	1322.35	(64)
·			Outp	ut from w	ater heater	(annual)	12		(64)
(64)m= 99.28 83.76 92.12 79.27 112	0.25 ´ [0.85 ×		Outp	ut from w	ater heater	(annual)	12		(64) (65)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month	0.25 ´ [0.85 × 12 44.85	42.7	Outp + (61)m 47.86	ut from wa] + 0.8 > 48.4	ater heater ([(46)m 55.35	(annual) ₁ + (57)m 59.05	+ (59)m]	_
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= 65.13 57.33 59.83 52.89 51.	0.25 ´ [0.85 × 12 44.85	42.7	Outp + (61)m 47.86	ut from wa] + 0.8 > 48.4	ater heater ([(46)m 55.35	(annual) ₁ + (57)m 59.05	+ (59)m]	_
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a):	0.25 ´ [0.85 × 12 44.85	42.7	Outp + (61)m 47.86	ut from wa] + 0.8 > 48.4	ater heater ([(46)m 55.35	(annual) ₁ + (57)m 59.05	+ (59)m]	_
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	0.25 ´ [0.85 × 12 44.85	42.7	Outp + (61)m 47.86	ut from wa] + 0.8 > 48.4	ater heater ([(46)m 55.35	(annual) ₁ + (57)m 59.05	+ (59)m]	_
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	0.25 ´ [0.85 × 12 44.85 if cylinder is i	42.7 42.7 in the d	Outp + (61)m 47.86 welling	ut from wa] + 0.8 > 48.4 or hot w	ater heater ([(46)m 55.35 ater is fr	+ (57)m 59.05 om com	+ (59)m 63.48 munity h]	_
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M	0.25 ´ [0.85 × 12	42.7 42.7 In the du	Outp + (61)m 47.86 welling o	1 + 0.8 > 48.4 or hot w Sep 131.34	ater heater ([(46)m 55.35 ater is fr	+ (57)m 59.05 om com	+ (59)m 63.48 munity h]	(65)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34 131.34 131.34 131.34 131	0.25 ´ [0.85 × 12	42.7 42.7 In the du	Outp + (61)m 47.86 welling o	1 + 0.8 > 48.4 or hot w Sep 131.34	ater heater ([(46)m 55.35 ater is fr	+ (57)m 59.05 om com	+ (59)m 63.48 munity h]	(65)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 ´ [0.85 × 12	42.7 42.7 in the do	Outp + (61)m 47.86 welling Aug 131.34 so see 1 10.44	Sep 131.34 Table 5	ater heater ([(46)m	(annual), + (57)m 59.05 om com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34 131.34 131.34 131.34 131.4 Lighting gains (calculated in Appendix L, equation)	0.25 ´ [0.85 × 12	42.7 42.7 in the do	Outp + (61)m 47.86 welling Aug 131.34 so see 1 10.44	Sep 131.34 Table 5	ater heater ([(46)m	(annual), + (57)m 59.05 om com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 [0.85 × 12 44.85] if cylinder is i ay Jun 34 131.34 uation L9 or L 1 7.44 equation L13 32 189.52	Jul 131.34 L9a), als 8.03 3 or L13	Outp + (61)m 47.86 welling Manual Section 131.34 so see 10.44 sa), also 176.49	Sep 131.34 Table 5 14.02 see Ta	oter heater (2) (46)m (55.35) atter is from 131.34 (17.8) ble 5 (196.06)	(annual), + (57)m 59.05 om com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34 131.34 131.34 131.34 131.34 131.34 131.34 131.4 131.34	0.25 ′ [0.85 × 12 44.85 15 cylinder is in 131.34 131.34 131.34 14 cylinder 15 cylinder 1	Jul 131.34 L9a), als 8.03 3 or L13 178.97 r L15a),	Outp + (61)m 47.86 welling Manual Section 131.34 so see 10.44 sa), also 176.49	Sep 131.34 Table 5 14.02 see Ta	oter heater (2) (46)m (55.35) atter is from 131.34 (17.8) ble 5 (196.06)	(annual), + (57)m 59.05 om com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67) (68)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34 131.34 131.34 131.34 131.34 131.4 131.34	0.25 ′ [0.85 × 12 44.85 15 cylinder is in 131.34 131.34 131.34 14 cylinder 15 cylinder 1	Jul 131.34 L9a), als 8.03 3 or L13	Outp + (61)m 47.86 welling of the second of	Sep 131.34 Fable 5 14.02 see Ta 182.74	oter heater (46)m 55.35 ater is from Oct 131.34 17.8 ble 5 196.06	(annual), + (57)m 59.05 om com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 [0.85 × 12 44.85] if cylinder is i ay Jun 34 131.34 uation L9 or L 1 7.44 equation L13 32 189.52 uation L15 or L 13 36.13	Jul 131.34 L9a), als 8.03 3 or L13 178.97 r L15a),	Outp + (61)m 47.86 welling 131.34 so see 10.44 sa), also 176.49 also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 Te Table 36.13	oter heater (2) (46)m (55.35) atter is from the continuous of the	(annual), + (57)m 59.05 om com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 ′ [0.85 × 12 44.85 15 cylinder is in a	Jul 131.34 L9a), als 8.03 3 or L13 178.97 r L15a),	Outp + (61)m 47.86 welling of the second of	Sep 131.34 Fable 5 14.02 see Ta 182.74	oter heater (46)m 55.35 ater is from Oct 131.34 17.8 ble 5 196.06	(annual), + (57)m 59.05 om com Nov 131.34 20.77	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 ´ [0.85 × 12	Jul 131.34 L9a), als 8.03 3 or L13 178.97 r L15a), 36.13	Outp + (61)m 47.86 welling Aug 131.34 so see 7 10.44 sa), also 176.49 also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 te Table 36.13	oter heater (46)m 55.35 ater is from 17.8 ble 5 196.06 5 36.13	Nov 131.34 20.77 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 ´ [0.85 × 12	Jul 131.34 L9a), als 8.03 3 or L13 178.97 r L15a), 36.13	Outp + (61)m 47.86 welling 131.34 so see 10.44 sa), also 176.49 also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 Te Table 36.13	oter heater (2) (46)m (55.35) atter is from the continuous of the	(annual), + (57)m 59.05 om com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
(64)m= 99.28 83.76 92.12 79.27 112 Heat gains from water heating, kWh/month (65)m= (65)m= 65.13 57.33 59.83 52.89 51. include (57)m in calculation of (65)m only 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr M (66)m= 131.34	0.25 ′ [0.85 × 12	Jul 131.34 L9a), als 8.03 3 or L13 178.97 r L15a), 36.13	Outp + (61)m 47.86 welling Aug 131.34 so see 7 10.44 sa), also 176.49 also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 te Table 36.13	oter heater (46)m 55.35 ater is from 17.8 ble 5 196.06 5 36.13	Nov 131.34 20.77 36.13	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal gain	s =				(66)	m + (67)m	ı + (68	3)m +	- (69)m + (7	70)m +	(71)m + (72)	m		
(73)m= 413.71 411.	55 396.84	372.78	348.24	32	4.65	309.8	316	.66	329.38	353.60	381.06	401.53		(73)
6. Solar gains:									,					
Solar gains are calcula	ted using sola	ar flux from	n Table 6a	and	associ	ated equa	tions	to co	nvert to the	applic	able orientat	ion.		
Orientation: Acces		Area	ì		Flux			_	g_ 		FF Table 0		Gains	
Table	60 	m²		_	ı ac	le 6a			able 6b	_	Table 6c		(W)	
	.77 ×	8.	19	x	3	6.79	X		0.63	X	0.7	=	92.09	(77)
Southeast 0.9x	.77 ×	8.	19	X	6	2.67	X		0.63	X	0.7	=	156.87	(77)
	.77 ×	8.	19	x	8	5.75	X		0.63	×	0.7	=	214.64	(77)
	.77 ×	8.	19	X	10	6.25	X		0.63	X	0.7	=	265.94	(77)
Southeast 0.9x 0	.77 ×	8.	19	X	11	9.01	X		0.63	X	0.7	=	297.88	(77)
	.77 ×	8.	19	X	11	8.15	X		0.63	X	0.7	=	295.73	(77)
	.77 ×	8.	19	X	11	3.91	X		0.63	X	0.7	=	285.11	(77)
	.77 ×	8.	19	X	10	4.39	X		0.63	X	0.7	=	261.29	(77)
	.77 ×	8.	19	x	9:	2.85	X		0.63	×	0.7	=	232.41	(77)
	.77 ×	8.	19	X	6	9.27	X		0.63	X	0.7	=	173.37	(77)
Southeast 0.9x 0	.77 ×	8.	19	x	4	4.07	X		0.63	×	0.7	=	110.31	(77)
Southeast 0.9x 0	.77 ×	8.	19	x	3	1.49	X		0.63	×	0.7	=	78.81	(77)
Southwest _{0.9x} 0	.77 ×	0.	55	x	3	6.79			0.63	X	0.7	=	6.18	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	x	6	2.67			0.63	×	0.7	=	10.53	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	X	8	5.75			0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	x	10	6.25			0.63	X	0.7	=	17.86	(79)
	.77 ×	0.	55	x	11	9.01			0.63	X	0.7	=	20	(79)
	.77 ×	0.	55	x	11	8.15			0.63	×	0.7	=	19.86	(79)
	.77 ×	0.	55	x	11	3.91			0.63	×	0.7	=	19.15	(79)
	.77 ×	0.	55	x	10	4.39			0.63	X	0.7	=	17.55	(79)
	.77 ×	0.	55	X	9:	2.85			0.63	X	0.7	=	15.61	(79)
	.77 ×	0.	55	x	6	9.27			0.63	×	0.7	=	11.64	(79)
	.77 ×	0.	55	x	4	4.07			0.63	×	0.7	=	7.41	(79)
	.77 ×	0.	55	x	3	1.49			0.63	×	0.7	=	5.29	(79)
	.77 ×	7.	55	X	1	1.28	X		0.63	X	0.7	=	26.03	(81)
	.77 ×	7.	55	x	2:	2.97	X		0.63	×	0.7	=	52.99	(81)
	.77 ×	7.	55	x	4	1.38	X		0.63	×	0.7	=	95.48	(81)
	.77 ×	7.	55	x	6	7.96	X		0.63	X	0.7	=	156.8	(81)
	.77 ×	7.	55	x	9	1.35	X		0.63	X	0.7	=	210.77	(81)
	.77 ×	7.	55	x	9	7.38	x		0.63	X	0.7	=	224.7	(81)
	.77 ×	7.	55	x	9	1.1	x		0.63	X	0.7	=	210.2	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	7:	2.63	x		0.63	X	0.7	=	167.58	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	5	0.42	x		0.63	X	0.7	=	116.34	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	2	3.07	X		0.63	X	0.7	=	64.76	(81)

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x [0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x [0.63	x	0.7	=	21.26	(81)
Rooflights 0.9x	1	X	1.0)1	x	16.37	x [0.63	x [0.7		6.56	(82)
Rooflights 0.9x	1	X	1.0)1	x	33.68	x [0.63	x	0.7	=	13.5	(82)
Rooflights 0.9x	1	X	1.0)1	x	62.13	x [0.63	x	0.7		24.91	(82)
Rooflights 0.9x	1	x	1.0)1	X ·	104.87	x	0.63	x	0.7	=	42.04	(82)
Rooflights 0.9x	1	x	1.0)1	X	143.66	x	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	x	1.0)1	X	154.33	×	0.63	x	0.7		61.87	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.9	x	0.63	x	0.7	=	57.69	(82)
Rooflights 0.9x	1	x	1.0)1	X	113.05	×	0.63	x	0.7		45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	x	0.63	x	0.7		30.69	(82)
Rooflights 0.9x	1	x	1.0)1	X	41.49	x	0.63	x	0.7		16.63	(82)
Rooflights 0.9x	1	X	1.0)1	x	20.65	X	0.63	x	0.7		8.28	(82)
Rooflights 0.9x	1	x	1.0)1	x	13.34	×	0.63	x	0.7		5.35	(82)
							_						
Solar gains ir	n watts, ca	alculated	for eacl	h month			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 130.87		349.43	482.64	586.24	602.16	572.15	491.7	73 395.04	266.41	158.75	110.71		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts				1		1	
(84)m= 544.59	645.45	746.27	855.42	934.48	926.81	881.95	808.3	39 724.42	620.07	539.81	512.25		(84)
7. Mean inte	ernal temp	perature ((heating	season)								
Temperatur	e during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
								` '				I	
Utilisation fa	ctor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)		, ,					
Utilisation fa	ctor for g	ains for I Mar	iving are Apr	ea, h1,m May	(see Ta	able 9a) Jul	Au		Oct	Nov	Dec]	
	 				<u> </u>	– –	Au 0.55	g Sep	Oct 0.94	Nov 0.98	Dec 0.99		(86)
(86)m= Jan 0.99	Feb 0.98	Mar 0.96	Apr 0.9	May 0.8	Jun 0.64	Jul 0.49	0.55	g Sep 5 0.78		_			(86)
Jan	Feb 0.98 al temper	Mar 0.96	Apr 0.9	May 0.8	Jun 0.64	Jul 0.49	0.55	g Sep 5 0.78 able 9c)		_			(86)
(86)m= 0.99 Mean intern (87)m= 19.17	Feb 0.98 al temper	0.96 ature in 1	Apr 0.9 living are 20.26	0.8 ea T1 (fo	Jun 0.64 ollow ste 20.89	Jul 0.49 eps 3 to 7 20.97	0.55 7 in Ta 20.9	g Sep 5 0.78 able 9c) 5 20.77	0.94	0.98	0.99		
Jan (86)m= 0.99 Mean intern	Feb 0.98 al temper 19.4 e during h	0.96 ature in 1	Apr 0.9 living are 20.26	0.8 ea T1 (fo	Jun 0.64 ollow ste 20.89	Jul 0.49 eps 3 to 7 20.97	0.55 7 in Ta 20.9	g Sep 5 0.78 able 9c) 5 20.77 , Th2 (°C)	0.94	0.98	0.99		
(86)m=	Feb 0.98 al temper 19.4 e during h	Mar 0.96 eature in l 19.78 neating p 19.93	Apr 0.9 living are 20.26 eriods ir 19.94	May 0.8 ea T1 (for 20.66 n rest of 19.95	Jun 0.64 bllow ste 20.89 dwelling 19.96	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96	0.55 7 in Ta 20.9 able 9	g Sep 5 0.78 able 9c) 5 20.77 , Th2 (°C)	0.94	19.62	0.99		(87)
Jan (86)m= 0.99 Mean intern (87)m= 19.17 Temperature (88)m= 19.92 Utilisation fa	Feb 0.98 al temper 19.4 e during h 19.93 actor for g	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r	Apr 0.9 living are 20.26 eriods ir 19.94	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling,	Jun 0.64 bllow ste 20.89 dwelling 19.96 h2,m (s	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table	0.557 in Ta 20.9 able 9 19.9 9a)	g Sep 5 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95	0.94 20.25 19.95	0.98 19.62 19.94	0.99 19.13		(87)
Jan (86)m= 0.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95	Apr 0.9 living are 20.26 eriods ir 19.94 rest of dv 0.88	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75	Jun 0.64 bllow ste 20.89 dwelling 19.96 h2,m (s 0.56	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39	0.557 in Ta 20.99 able 9 19.9 9a)	g Sep 5 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95	0.94 20.25 19.95	19.62	0.99		(87)
Jan (86)m= 0.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper	Mar 0.96 eature in language in 19.78 neating p 19.93 ains for r 0.95 eature in the second in the sec	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelli	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39 follow ste	0.557 in Ta 20.99 able 9 19.9 9a) 0.44	g Sep 0.78 able 9c) 5 20.77 Th2 (°C) 6 19.95 0.71 to 7 in Table	0.94 20.25 19.95 0.92 e 9c)	0.98 19.62 19.94 0.98	0.99 19.13 19.94 0.99		(87) (88) (89)
Jan (86)m= 0.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95	Apr 0.9 living are 20.26 eriods ir 19.94 rest of dv 0.88	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75	Jun 0.64 bllow ste 20.89 dwelling 19.96 h2,m (s 0.56	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39	0.557 in Ta 20.99 able 9 19.9 9a)	g Sep 0.78 able 9c) 5 20.77 Th2 (°C) 6 19.95 4 0.71 to 7 in Table 3 19.74	0.94 20.25 19.95 0.92 e 9c) 19.06	0.98 19.62 19.94 0.98	0.99 19.13 19.94 0.99		(87) (88) (89) (90)
Jan (86)m= 0.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper	Mar 0.96 eature in language in 19.78 neating p 19.93 ains for r 0.95 eature in the second in the sec	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelli	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39 follow ste	0.557 in Ta 20.99 able 9 19.9 9a) 0.44	g Sep 0.78 able 9c) 5 20.77 Th2 (°C) 6 19.95 4 0.71 to 7 in Table 3 19.74	0.94 20.25 19.95 0.92 e 9c) 19.06	0.98 19.62 19.94 0.98	0.99 19.13 19.94 0.99	0.27	(87) (88) (89)
Jan (86)m= 0.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95 ature in 1 18.37	Apr 0.9 living are 20.26 eriods ir 19.94 rest of de 0.88 the rest 19.06	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling, 19.59	Jun 0.64 collow sterms 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87)	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39 follow ste	0.557 in Ta 20.99 able 9 19.9 9a) 0.44 eps 3 19.9	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74	0.94 20.25 19.95 0.92 e 9c) 19.06	0.98 19.62 19.94 0.98	0.99 19.13 19.94 0.99	0.27	(87) (88) (89) (90)
Jan (86)m= 0.99 Mean intern (87)m= 19.17 Temperature (88)m= 19.92 Utilisation far (89)m= 0.99 Mean intern (90)m= 17.48	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95 ature in 1 18.37	Apr 0.9 living are 20.26 eriods ir 19.94 rest of de 0.88 the rest 19.06	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling, 19.59	Jun 0.64 collow sterms 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87)	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39 follow ste	0.557 in Ta 20.99 able 9 19.9 9a) 0.44 eps 3 19.9	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74	0.94 20.25 19.95 0.92 e 9c) 19.06	0.98 19.62 19.94 0.98	0.99 19.13 19.94 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95 ature in 1 18.37	Apr 0.9 living are 20.26 eriods ir 19.94 rest of de 0.88 the rest 19.06 r the wh	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling, 19.59 ole dwe 19.88	Jun 0.64 collow sterms 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (f 19.87	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39 follow ste 19.94 FLA × T1 20.22	0.55 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 19.9 + (1 - 20.2	g Sep 5 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f -fLA) × T2 1 20.02	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4	0.99 19.13 19.94 0.99 17.44 4) =	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26 tment to t	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95 ature in 1 18.37	Apr 0.9 living are 20.26 eriods ir 19.94 rest of de 0.88 the rest 19.06 r the wh	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling, 19.59 ole dwe 19.88	Jun 0.64 collow sterms 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (f 19.87	Jul 0.49 eps 3 to 7 20.97 g from Ta 19.96 ee Table 0.39 follow ste 19.94 FLA × T1 20.22	0.55 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 19.9 + (1 - 20.2	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f - fLA) × T2 1 20.02 where approximates	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4	0.99 19.13 19.94 0.99 17.44 4) =	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26 tment to ti 18.11 ating required	Mar 0.96 eature in language in 19.78 neating part 19.93 ains for rature in tale 18.37 eature (for 18.76) he mean 18.61 uirement	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest 19.06 r the wh 19.39 internal 19.24	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelli 19.59 ole dwe 19.88 I temper 19.73	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87 lling) = 1 20.15 ature fro 20	Jul	0.55 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 19.9 + (1 - 20.2 4 4 e, w 20.0	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f - fLA) × T2 1 20.02 where appro	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi 19.38 ppriate 19.23	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4) 18.56	0.99 19.13 19.94 0.99 17.44 17.9		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.99 Mean intern (87)m= 19.17 Temperature (88)m= 19.92 Utilisation fa (89)m= 0.99 Mean intern (90)m= 17.48 Mean intern (92)m= 17.94 Apply adjust (93)m= 17.79 8. Space he Set Ti to the	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26 tment to t 18.11 ating requires	Mar 0.96 ature in 1 19.78 neating p 19.93 ains for r 0.95 ature in 1 18.37 ature (fo 18.76 he mean 18.61 uirement ternal ternal ternal ternal ternal	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest 19.06 r the wh 19.39 internal 19.24	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling 19.59 cole dwe 19.88 temper 19.73	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87 lling) = 1 20.15 ature fro 20	Jul	0.55 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 19.9 + (1 - 20.2 4 4 e, w 20.0	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f - fLA) × T2 1 20.02 where appro	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi 19.38 ppriate 19.23	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4) 18.56	0.99 19.13 19.94 0.99 17.44 17.9		(87) (88) (89) (90) (91) (92)
Mean intern (92)m= 17.48 Mean intern (93)m= 17.48 Mean intern (92)m= 17.94 Apply adjust (93)m= 17.79 Set Ti to the the utilisation 10.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26 tment to t 18.11 ating requires mean interper factor for	Mar 0.96 ature in langer of the mean 18.61 ature in the mean 18.61 ature in the mean 18.61 ature in the mean ature in	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest 19.06 r the wh 19.39 internal 19.24 mperaturusing Ta	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling, 19.59 ole dwe 19.88 temper 19.73 re obtain able 9a	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87 lling) = 1 20.15 ature fro 20 ned at st	Jul	0.557 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 1 20.2 4e, v 20.0 Table	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f -fLA) × T2 1 20.02 where appro 6 19.87	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi 19.38 ppriate 19.23 t Ti,m=	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4 18.56 18.41 (76)m and	0.99 19.13 19.94 0.99 17.44 17.9 17.75 d re-cald		(87) (88) (89) (90) (91) (92)
Mean intern (86)m= 19.17 Temperature (88)m= 19.92 Utilisation fa (89)m= 0.99 Mean intern (90)m= 17.48 Mean intern (92)m= 17.94 Apply adjust (93)m= 17.79 8. Space he the utilisation Jan	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26 tment to th 18.11 ating requires the mean into factor for g Feb	Mar 0.96 ature in langle ating parature in tale ating parature in tale ating parature in tale ating parature in tale ating parature (for langle ating parature ating parature in tale	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest 19.06 r the wh 19.39 internal 19.24 mperaturusing Ta Apr	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling 19.59 cole dwe 19.88 temper 19.73	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87 lling) = 1 20.15 ature fro 20	Jul	0.55 7 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 19.9 + (1 - 20.2 4 4 e, w 20.0	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f -fLA) × T2 1 20.02 where appro 6 19.87	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi 19.38 ppriate 19.23	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4) 18.56	0.99 19.13 19.94 0.99 17.44 17.9		(87) (88) (89) (90) (91) (92)
Mean intern (92)m= 17.48 Mean intern (93)m= 17.48 Mean intern (92)m= 17.94 Apply adjust (93)m= 17.79 Set Ti to the the utilisation 10.99	Feb 0.98 al temper 19.4 e during h 19.93 actor for g 0.97 al temper 17.83 al temper 18.26 tment to th 18.11 ating requires the mean into factor for g Feb	Mar 0.96 ature in langle ating parature in tale ating parature in tale ating parature in tale ating parature in tale ating parature (for langle ating parature ating parature in tale	Apr 0.9 living are 20.26 eriods ir 19.94 rest of do 0.88 the rest 19.06 r the wh 19.39 internal 19.24 mperaturusing Ta Apr	May 0.8 ea T1 (for 20.66 n rest of 19.95 welling, 0.75 of dwelling, 19.59 ole dwe 19.88 temper 19.73 re obtain able 9a	Jun 0.64 ollow ste 20.89 dwelling 19.96 h2,m (s 0.56 ng T2 (19.87 lling) = 1 20.15 ature fro 20 ned at st	Jul	0.557 in Ta 20.9 able 9 19.9 9a) 0.44 eps 3 1 20.2 4e, v 20.0 Table	g Sep 0.78 able 9c) 5 20.77 , Th2 (°C) 6 19.95 4 0.71 to 7 in Tabl 3 19.74 f -fLA) × T2 1 20.02 where appro 6 19.87 e 9b, so that g Sep	0.94 20.25 19.95 0.92 e 9c) 19.06 LA = Livi 19.38 ppriate 19.23 t Ti,m=	0.98 19.62 19.94 0.98 18.16 ng area ÷ (4 18.56 18.41 (76)m and	0.99 19.13 19.94 0.99 17.44 17.9 17.75 d re-cald		(87) (88) (89) (90) (91) (92)

Heaf	ul gains,	hmGm	\\/ - (Q/	1)m v (8.	1)m									
(95)m=		621.54	695.04	736.7	688.7	518.8	351.11	364.84	508.79	557.1	520.86	503.11		(95)
, ,	thly aver						001.11	004.04	000.70	007.1	020.00	000.11		(00)
(96)m=		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	Į.			
(97)m=	1453.48	1418.24	1295.8	1090.3	844.23	560.39	360.24	379.03	602.3	907.73	1196.2	1441.75		(97)
Spac	ce heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	684.93	535.38	446.97	254.6	115.72	0	0	0	0	260.87	486.24	698.35		
		-	-	-	-	-	-	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3483.05	(98)
Spac	ce heatin	g require	ement in	kWh/m²	²/year							[38.67	(99)
9a. Er	nergy red	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	ce heatir	•										-		_
Fract	tion of sp	ace hea	it from se	econdar	y/supple	mentary	-					Į	0	(201)
Frac	tion of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =			Ĺ	1	(202)
Fract	tion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Effici	iency of ı	main spa	ace heat	ing syste	em 1								90.4	(206)
Effici	iency of	seconda	ry/supple	ementar	y heating	g systen	າ, %					[0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Spac	ce heatin	g require	ement (c	alculate	d above)								
	684.93	535.38	446.97	254.6	115.72	0	0	0	0	260.87	486.24	698.35		
(211)r	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	757.67	592.23	494.43	281.63	128.01	0	0	0	0	288.57	537.88	772.51		_
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	- [3852.94	(211)
•	ce heatin	•		• , .	month									
	B)m x (20		00 ÷ (20		1	1								
(215)m	= 0	0	0	0	0	0	0	0	0	0	0	0		_
								lota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	- L	0	(215)
	r heating	•												
Outpu	It from w 99.28	83.76	ter (caic 92.12	79.27	112.31	142.33	136.42	152.08	153.77	85.77	89.52	95.74		
Efficie	ency of w			10.21	112.01	1 12.00	100.12	102.00	100.77	00.77	00.02	00.7 1	80.3	(216)
(217)m		88.89	88.5	87.78	85.13	80.3	80.3	80.3	80.3	87.67	88.67	89.05	00.0	(217)
, ,	or water	L heating.		nth	<u> </u>	<u> </u>					<u> </u>			
	n = (64)	•												
(219)m	= 111.57	94.23	104.09	90.3	131.93	177.24	169.89	189.39	191.49	97.83	100.97	107.51		_
								Tota	I = Sum(2	19a) ₁₁₂ =		L	1566.44	(219)
	al totals									k\	Wh/year		kWh/year	_
Space	e heating	fuel use	ed, main	system	1							Ĺ	3852.94	╛
Water	heating	fuel use	d									[1566.44	_
Electr	icity for p	oumps, fa	ans and	electric	keep-ho	t								
centr	ral heatir	g pump										30		(230c)

boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sun	n of (230a)(230g) =	75 (231)
Electricity for lighting			380.53 (232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b)) =	5874.91 (338)
12a. CO2 emissions – Individual heating system	s including micro-CHF		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	832.23 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	338.35 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	1170.59 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519	197.49 (268)
Total CO2, kg/year		sum of (265)(271) =	1407 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	15.62 (273)

El rating (section 14)

(274)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:51:26

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 90.08m² Site Reference: 119 East Road -BASE Plot Reference: Sample 3

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.63 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.53 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²

2 Fabric U-values

Element Highest **Average** External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) OK Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas

Data from manufacturer

Combi boiler

Efficiency 89.5 % SEDBUK2009

Minimum 88.0 %

OK

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

OK

6 Controls

Space heating controls TTZC by plumbing and electrical services

OK No cylinder thermostat

No cylinder

OK Boiler interlock: Yes

7 Low energy lights

Hot water controls:

Percentage of fixed lights with low-energy fittings 100.0% 75.0% OK Minimum

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Slight Overheating risk (Thames valley):

Based on:

Overshading: Average or unknown

Windows facing: North West 7.55m² Windows facing: South East $8.19m^{2}$ 0.55m² Windows facing: South West 1.01m² Roof windows facing: North West Ventilation rate: 4.00

10 Key features

Roofs U-value 0.12 W/m²K 0 W/m²K Party Walls U-value

OK

			User D	etails:						
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12		Softwa	are Ver	sion:		Versio	n: 1.0.5.41	
		Р	roperty <i>i</i>	Address	Sample	3				
Address: 1. Overall dwelling dime	nsions:									
1. Overall dwelling diffie	11510115.		Area	a(m²)		Av. He	iaht(m)		Volume(m³))
Ground floor				3.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			3	3.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor				23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 9	0.08	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0] + [0	_ = _	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent far	ns				Ī	3	x	10 =	30	(7a)
Number of passive vents					Ī	0	x	10 =	0	(7b)
Number of flueless gas fir	res				Ī	0	X 4	40 =	0	(7c)
								A in ah	angaa naw ba	_
Infiltration due to chimney	ve fluor and fans - (f	3a)+(6h)+(7	/a)+(7h)+(7c) =	Г				nanges per ho	_
If a pressurisation test has be					continue fr	30 om (9) to (÷ (5) =	0.13	(8)
Number of storeys in th		.,	, ,,			, , ,	,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber	frame or	0.35 for	masoni	y constr	uction			0	(11)
if both types of wall are producting areas of openin		sponding to	the great	er wall are	a (after					
If suspended wooden fl		iled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0								0	(13)
Percentage of windows	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	ur per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.38	(18)
Air permeability value applies		s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered Shelter factor	d			(20) = 1 -	IO 075 v (1	0)1 =			0	(19)
	ing aboltor factor			,	`	J)] -			1	(20)
Infiltration rate incorporati Infiltration rate modified for	-	d		(21) = (18	, ^ (20) -				0.38	(21)
	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		1 0011		, .ug	L COP		1	1 200	I	
 	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		1		<u> </u>			<u> </u>		I	

Wind Fa	actor (2	2a)m =	(22)m ÷	4				•		•		,			
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	ation rate	e (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m						
[0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45			
		<i>tive air</i> d al ventila	•	rate for t	he appli	cable ca	se							0	(23a
_				endix N, (2	.3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)				0	(23b
If balaı	nced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (fror	n Table 4h) =					0	(23c
a) If b	oalance	d mecha	anical ve	entilation	with hea	at recov	ery (MV	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 b	palance	d mecha	anical ve	entilation	without	heat red	covery (I	MV) (24b)m = (2:	2b)m + (23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b
,					•	•		on from o							
Г	<u> </u>			· ·	ŕ		<u> </u>	c) = (22b	 	· ·	<u> </u>		ı		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,					•			on from I 0.5 + [(2		0.51					
(24d)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]		(24d
` ′ L								ld) in box					l		Ì
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6			(25)
0 11	. ()				<u>l</u>	<u> </u>				<u> </u>			l		
ਤ. ਜea	ar insse														
				paramet Openin		Not Ar	-02	l I_valı	10	ΔΥΠ		k_value	<u>.</u>	ΔΥ	k
ELEM		Gros area	ss	paramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	<)	k-value kJ/m²·ł		A X kJ/K	
		Gros	ss	Openin	gs		m²			_	<) 				
ELEM	ENT	Gros area	ss	Openin	gs	A ,r	m² x	W/m2	2K =	(W/	<) 				
ELEM Doors	I ENT vs Type	Gros area	ss	Openin	gs	A ,r	m ² x x1	W/m2	eK = 0.04] =	(W/ 2.736	<) 				(26)
ELEM Doors Window	IENT vs Type vs Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55	m ² x x1 x1	W/m2 1.2 /[1/(1.2)+	0.04] =	(W/) 2.736 8.65	<) 				(26)
ELEM Doors Window Window	VS Type VS Type VS Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38	<)				(26) (27) (27)
ELEM Doors Window Window Window	VS Type VS Type VS Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38 0.63					(26) (27) (27) (27)
Doors Window Window Window Roofligh	VS Type VS Type VS Type VS Type hts	Gros area	es (m²)	Openin	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	x1 x1 x1 x1 x1 x1	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212		kJ/m²·l		kJ/K	(26) (27) (27) (27) (27b)
ELEM Doors Window Window Window Roofligh Floor	vs Type vs Type vs Type hts	Gros area 1 2 2	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676		kJ/m²·l		kJ/K 3667.4	(26) (27) (27) (27) (27b) (28)
Doors Window Window Window Roofligh Floor Walls T	vs Type vs Type vs Type hts ype1 ype2	Gros area 1 2 2 3	68 2	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18	0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		410 60		3667.4 6606.6	(26) (27) (27) (27) (27b (28) (29)
Doors Window Window Roofligh Floor Walls T	vs Type vs Type vs Type hts ype1 ype2 ype1	Gros area 1 2 3 128.6	68 2 9 9	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62	X X1 X1 X1 X1 X X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		110 60 9		3667.4 6606.6 59.58	(26) (27) (27) (27) (27b (28) (29)
Doors Window Window Roofligh Floor Walls T Walls T Roof T	vs Type vs Type vs Type hts ype1 ype2 ype1 ype2	Gros area 1 2 3 128.6 6.62 25.5	68 2 9	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	X X1 X1 X1 X1 X X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95		110 60 9		3667.4 6606.6 59.58 221.22	(26) (27) (27) (27) (27b (28) (29) (29) (30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T	vs Type vs Type vs Type hts ype1 ype2 ype1 ype2 ype3	Gros area 1	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22	X X1 X1 X1 X1 X1 X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98	(26) (27) (27) (27) (27b (28) (29) (29) (30) (30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T	vs Type vs Type thts Type1 Type2 Type2 Type3 Type3 Type3 of e	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98	(26) (27) (27) (27) (27b (28)](29)](29)](30)](30)
Doors Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T Total ar	vs Type vs Type vs Type thts ype1 ype2 ype1 ype2 ype3 rea of e	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27b (28)](29)](30)](30) (31)](32)
ELEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Roof T Total ar Party w	vs Type vs Type vs Type thts Type1 Type2 Type2 Type3 Type3 Trea of e vall I wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27) (28)](29)](30)](30) (31)
ELEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Total ar Party w Internal	vs Type vs Type vs Type hts ype1 ype2 ype3 rea of e vall I wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48 1766.7 859.5	(26) (27) (27) (27) (27b (28)](29)](30)](30) (31)](32)](32c
CLEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Roof T rotal ar Party w nternal nternal	vs Type vs Type vs Type thts Type1 Type2 Type3 rea of e vall I wall ** I floor I ceiling	Gros area 1 2 3 128.6 6.62 25.5 6.22 3.72 Ilements	68 2 9 2 2 , m²	18.5 0 1.01 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.3 ² 110.1 6.62 24.58 6.22 3.72 204.1 39.26 95.5 56.7 ²	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	eK = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62 0.34		110 60 9 9 9 9 18 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27) (28)](29)](30) [(30) (31)](32)](32)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

52.14

(33)

Heat capacity Cm :	= S(A x k)						((28)	.(30) + (32	?) + (32a).	(32e) =	14802.44	(34)
Thermal mass para	meter (TMF	⊃ = Cm ÷	÷ TFA) ir	ı kJ/m²K			= (34)	÷ (4) =			164.33	(35)
For design assessment	s where the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	10 1.00	
Thermal bridges : S	S (L x Y) cal	culated i	using Ap	pendix I	Κ						17.27	(36)
if details of thermal brid	ging are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric heat los	SS						(33) +	(36) =			69.41	(37)
Ventilation heat los	s calculated	monthly	у				(38)m	= 0.33 × (25)m x (5)			
Jan Fo	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 45.62 45.	28 44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer coeffi	cient, W/K						(39)m	= (37) + (3	38)m			
(39)m= 115.03 114	69 114.35	112.77	112.48	111.1	111.1	110.85	111.63	112.48	113.08	113.7		
Heat loss paramete	er (HLP), W	/m²K						Average = = (39)m ÷	` '	12 /12=	112.77	(39)
(40)m= 1.28 1.2	7 1.27	1.25	1.25	1.23	1.23	1.23	1.24	1.25	1.26	1.26		
Number of days in	month (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.25	(40)
Jan F	eb 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 6	energy requi	irement:								kWh/ye	ear:	
Assumed occupant if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres	= 1 + 1.76 x = 1 t water usag age hot water	ge in litre	es per da 5% if the d	ay Vd,av welling is	erage = designed t	(25 x N)	+ 36		9)	.59		(42)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres	= 1 + 1.76 x = 1 t water usag age hot water per person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target of	9) 96	.59		` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual averant more that 125 litres	= 1 + 1.76 x = 1 t water usage rage hot water per person per eb Mar	ge in litre usage by s day (all w	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36		9)			` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d rater use, f May Vd,m = fac	ay Vd,av welling is not and co. Jun ctor from	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43)	+ 36 a water us Sep	ce target of	9) 96 Nov	.59 Dec		` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual averant more that 125 litres	= 1 + 1.76 x = 1 t water usagage hot water per person per eb Mar	ge in litre usage by s day (all w	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us Sep	Oct 98.52	9) 96 Nov 102.38	.59 Dec 106.25	1159.04	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, t May Vd,m = fac 90.79	ay Vd,av welling is not and co. Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Sui	9) Nov 102.38 m(44) ₁₁₂ =	.59 Dec 106.25	1159.04	` ,
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, t May Vd,m = fac 90.79	ay Vd,av welling is not and co. Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Total = Sui	9) Nov 102.38 m(44) ₁₁₂ =	.59 Dec 106.25	1159.04	(43)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52 ater used - cal	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,av welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA > 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52 ater used - cal	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,av welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Total = Sun th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water hou wa	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar s per day for ea 38 98.52 ater used - cal 8 142.2 eating at point	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the d rater use, h May Vd,m = fact 90.79 onthly = 4.	y Vd,av welling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon 110.45	Oct 98.52 Total = Sun th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water house (46)m= 23.63 20. Water storage loss	= 1 + 1.76 x = 1 t water usage hot water per person per bb Mar per day for each and per day f	ge in litre usage by s day (all w Apr ach month 94.66 culated mo 123.97	es per da 5% if the d vater use, h May Vd,m = fac 90.79	y Vd,av lwelling is not and co. Jun ctor from 7 86.93 190 x Vd,r 102.65	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79 77m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur th (see Ta 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water hou water storage loss Storage volume (lit	= 1 + 1.76 x = 1 t water usage hot water per person per sper day for each sper day for each sper used - calculater used - calculater used - calculater used sper day for each specific for each sper day for each sper day for each sper day for each specific for each	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no	es per da 5% if the d sater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 plar or W	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 x storage), 15.4	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur th (see Ta 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual aver not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water house (46)m= 23.63 20. Water storage loss	et used - cal ater used - cal	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so	es per da 5% if the d vater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water h (46)m= 23.63 20. Water storage loss Storage volume (lit If community heatin Otherwise if no sto	= 1 + 1.76 x = 1 t water usage hot water per person per	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and any so ank in dw er (this in	es per da 5% if the d rater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water hou water storage loss Storage volume (little community heating otherwise if no sto water storage loss Water storage loss Water storage loss	= 1 + 1.76 x = 1 t water usage hot water per person per eb Mar sper day for ea 38 98.52 ater used - cal 142.2 eating at point 67 21.33 res) includiring and no taled hot water is declared I	ge in litre usage by a day (all w Apr ach month 94.66 123.97 for use (not) 18.6 and in dw er (this in	es per da 5% if the d rater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13.9, N if TFA £ 13.9, N if TFA £ 13.9, N Annual average ho Reduce the annual average not more that 125 litres Jan Fo Hot water usage in litres (44)m= 106.25 102 Energy content of hot w (45)m= 157.56 137 If instantaneous water h (46)m= 23.63 20. Water storage loss Storage volume (lit If community heatin Otherwise if no sto Water storage loss a) If manufacturer	et water usage hot water per person per eb Mar sper day for ea as 98.52 ater used - cal seating at point es includiring and no tared hot water is declared I from Table ater storage	ge in litre usage by a day (all w Apr ach month 94.66 culated mo 123.97 for use (no 18.6 ank in dw er (this in oss factor 2b	es per da 5% if the d rater use, f May Vd,m = far 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W relling, e includes in or is knowear	y Vd,av welling is not and co. Jun etor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage 0 litres in neous con/day):	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)

	ter stora	-			e 2 (kW	h/litre/da	ıy)					0		(51)
	munity he	-		on 4.3									1	
	e factor fr erature fa			2h							-	0		(52)
•								(47) v (E4)	. v. (EQ) v. ('E2\ -		0]	(53)
	/ lost fron (50) or (5		_	, KVVN/ye	ear			(47) x (51)) X (52) X ((53) =	-	0		(54) (55)
	storage l	, ,	•	for each	month			((56)m = (55) × (41)	m		U		(55)
										1			1	(50)
(56)m=	0 er contains	0 dedicated	0 d solar sto	0 rage (57):	0 = (56)m	0	0 H11)] ÷ (5	0	0 7)m = (56)	0 m where (0 H11) is fro	0 m Annend	liv H	(56)
-					1						•		1	(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	y circuit l	•										0		(58)
	y circuit l				•	,	,	` '		41	-4-4\			
•	dified by f				1					1		_	1	(59)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(39)
Combi	loss calc	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m		,	,		•	
(61)m=	50.96	46.03	50.2	46.68	46.27	42.87	44.3	46.27	46.68	50.2	49.32	50.96		(61)
Total h	eat requi	ired 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=	208.52	183.83	192.4	170.65	165.22	145.52	139.42	155.42	157.13	178.93	189.83	203.55		(62)
Solar DI	HW input ca	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	ır contribut	ion to wate	er heating)		
(add a	dditional	lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix ()				•	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	110.33	100.81	101.04	91.82	62.31	3.19	2.99	3.34	3.37	93.58	101.01	108.85		(63) (G2)
Output	from wat	ter hea	ter											
		101 1104				-							•	
(64)m=	98.19	83.02	91.37	78.84	102.91	142.33	136.42	152.08	153.77	85.35	88.82	94.69		7
	98.19	83.02	91.37					Outp	out from w	ater heate	I r (annual)₁	12	1307.78	(64)
Heat g	98.19	83.02	91.37	kWh/m	onth 0.2	5 ′ [0.85		Outp	out from w	ater heate	I r (annual)₁	12		_
Heat g	98.19	83.02	91.37	kWh/m		5 ′ [0.85		Outp	out from w	ater heate	I r (annual)₁	12		(64) (65)
Heat g (65)m=	98.19	83.02 n water 57.33	91.37 heating, 59.83	kWh/mo	onth 0.29	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu	98.19 ains from 65.13	83.02 n water 57.33 n in calc	91.37 heating, 59.83 culation of	kWh/mo 52.89 of (65)m	onth 0.29 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu 5. Int	98.19 ains from 65.13 ade (57)m	83.02 n water 57.33 n in calc ns (see	91.37 heating, 59.83 culation of	kWh/mo 52.89 of (65)m and 5a	onth 0.29 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from word + 0.8	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu 5. Int	98.19 ains from 65.13 ide (57)m ernal gai	83.02 n water 57.33 n in calc ns (see	91.37 heating, 59.83 culation of	kWh/mo 52.89 of (65)m and 5a	onth 0.29 51.12 only if c	5 ´ [0.85 44.85	× (45)m	Outr + (61)m 47.86	out from wo n] + 0.8 x 48.4	ater heate x [(46)m 55.35	+ (57)m 59.05	+ (59)m]	_
Heat g (65)m= inclu 5. Int	ains from 65.13 ide (57)m ernal gai olic gains Jan	83.02 n water 57.33 n in calc ns (see	91.37 heating, 59.83 culation of Table 5	kWh/mo 52.89 of (65)m 5 and 5a	onth 0.29 51.12 only if c	5 ´ [0.85 44.85 ylinder is	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling	out from w 1] + 0.8 x 48.4 or hot w	ater heate x [(46)m 55.35 vater is fr	+ (57)m 59.05	+ (59)m 63.48 munity h]	_
Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 ide (57)m ernal gai olic gains Jan	83.02 n water 57.33 n in calc ns (see 6 (Table Feb 131.34	91.37 heating, 59.83 culation of the Table 5 culation of the Table 5 mar. 131.34	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.29 51.12 only if c): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heate x [(46)m 55.35 vater is fr	+ (57)m + (57)m 59.05 rom com	+ (59)m 63.48 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m=	ains from 65.13 Ide (57)m ernal gai olic gains Jan 131.34	83.02 n water 57.33 n in calc ns (see 6 (Table Feb 131.34	91.37 heating, 59.83 culation of the Table 5 culation of the Table 5 doi: 10.00000000000000000000000000000000000	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34	onth 0.29 51.12 only if c): May	5 ´ [0.85 44.85 ylinder is Jun 131.34	× (45)m 42.7 s in the o	Outp + (61)m 47.86 dwelling Aug 131.34	out from w 1] + 0.8 x 48.4 or hot w Sep 131.34	ater heate x [(46)m 55.35 vater is fr	+ (57)m + (57)m 59.05 rom com	+ (59)m 63.48 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	ains from 65.13 de (57)m ernal gain olic gains Jan 131.34 g gains (water 57.33 n in calc ns (see s (Table Feb 131.34 calcular 19.14	91.37 heating, 59.83 culation (ce Table 5), Wat Mar 131.34 ted in Ap 15.56	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.29 51.12 only if c): May 131.34 L, equat 8.81	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heate x [(46)m 55.35 vater is fr Oct 131.34	+ (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	ains from 65.13 Ide (57)m ernal gains olic gains Jan 131.34 g gains (21.55 nces gain	water 57.33 n in calc ns (see s (Table Feb 131.34 calcular 19.14	91.37 heating, 59.83 culation (ce Table 5), Wat Mar 131.34 ted in Ap 15.56	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.29 51.12 only if c): May 131.34 L, equat 8.81	Jun 131.34 ion L9 of	× (45)m 42.7 s in the o Jul 131.34 r L9a), a 8.03	Outp + (61)m 47.86 dwelling Aug 131.34 lso see	Sep 131.34 Table 5	ater heate x [(46)m 55.35 vater is fr Oct 131.34	+ (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ains from 65.13 Ide (57)m ernal gains olic gains Jan 131.34 g gains (21.55 nces gain	83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71	91.37 heating, 59.83 culation of Table 5 25), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13	onth 0.29 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	98.19 ains from 65.13 de (57)m cernal gain blic gains Jan 131.34 g gains (21.55 nces gain 239.22	83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71	91.37 heating, 59.83 culation of Table 5 25), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13	onth 0.29 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 47.86 dwelling Manual 131.34 Iso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34	+ (59)m 63.48 munity h Dec 131.34]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	ains from 65.13 de (57)m ernal gair olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcula 36.13	91.37 heating, 59.83 culation of Table 5 25), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in Ap 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 51.12 only if c): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Table	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	98.19 ains from 65.13 de (57)m ernal gains olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (36.13	83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcula 36.13	91.37 heating, 59.83 culation of Table 5 25), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 ted in Ap 36.13	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 51.12 only if c): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 7.44 uation L 189.52	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 47.86 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Table	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06	r (annual) ₁ + (57)m	+ (59)m 63.48 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	98.19 ains from 65.13 de (57)m ernal gain blic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (36.13 and fans	83.02 n water 57.33 n in calc ns (see 6 (Table Feb 131.34 calcular 19.14 ns (calcular 241.71 (calcular 36.13 s gains 3	91.37 heating, 59.83 culation of the Table 5 5 5), Wate Mar 131.34 ted in Apr 15.56 ulated in Apr 235.45 ted in Apr 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 51.12 only if c): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (36.13 and fans	83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcula 36.13 s gains 3	91.37 heating, 59.83 culation of the Table 5 5 5), Wate Mar 131.34 ted in Apr 15.56 ulated in Apr 235.45 ted in Apr 36.13 (Table 5	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 51.12 only if c): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling Malso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual), + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (36.13 and fans 3 s e.g. eva	83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcular 36.13 s gains 3 aporatio -105.07	91.37 heating, 59.83 culation of Table 5 15.56 ulated in Ap 15.56 ulated in Ap 36.13 (Table 5 3 on (negative)	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13 5a) 3	onth 0.29 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 as (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	98.19 ains from 65.13 de (57)m ernal gai olic gains Jan 131.34 g gains (21.55 nces gain 239.22 ng gains (36.13 and fans 3 s e.g. eva	83.02 n water 57.33 n in calc ns (see Feb 131.34 calcular 19.14 ns (calc 241.71 (calcular 36.13 s gains 3 aporatio -105.07	91.37 heating, 59.83 culation of Table 5 15.56 ulated in Ap 15.56 ulated in Ap 36.13 (Table 5 3 on (negative)	kWh/mo 52.89 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13 5a) 3	onth 0.29 51.12 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 as (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 42.7 s in the off Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 47.86 dwelling 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	ater heate x [(46)m 55.35 vater is fr Oct 131.34 17.8 ble 5 196.06 2 5 36.13	r (annual) ₁ + (57)m 59.05 rom com Nov 131.34 20.77 212.87	+ (59)m 63.48 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal gain	s =				(66)	m + (67)m	ı + (68	3)m +	- (69)m + (7	70)m +	(71)m + (72)	m		
(73)m= 413.71 411.	55 396.84	372.78	348.24	32	4.65	309.8	316	.66	329.38	353.60	381.06	401.53		(73)
6. Solar gains:									,					
Solar gains are calcula	ted using sola	ar flux from	n Table 6a	and	associ	ated equa	tions	to co	nvert to the	applic	able orientat	ion.		
Orientation: Acces		Area	ì		Flux			_	g_ 		FF Table 0		Gains	
Table	60 	m²		_	ı ac	le 6a			able 6b	_	Table 6c		(W)	
	.77 ×	8.	19	x	3	6.79	X		0.63	X	0.7	=	92.09	(77)
Southeast 0.9x	.77 ×	8.	19	X	6	2.67	X		0.63	X	0.7	=	156.87	(77)
	.77 ×	8.	19	x	8	5.75	X		0.63	×	0.7	=	214.64	(77)
	.77 ×	8.	19	X	10	6.25	X		0.63	X	0.7	=	265.94	(77)
Southeast 0.9x 0	.77 ×	8.	19	X	11	9.01	X		0.63	X	0.7	=	297.88	(77)
	.77 ×	8.	19	X	11	8.15	X		0.63	X	0.7	=	295.73	(77)
	.77 ×	8.	19	X	11	3.91	X		0.63	X	0.7	=	285.11	(77)
	.77 ×	8.	19	X	10	4.39	X		0.63	X	0.7	=	261.29	(77)
	.77 ×	8.	19	x	9:	2.85	X		0.63	×	0.7	=	232.41	(77)
	.77 ×	8.	19	X	6	9.27	X		0.63	X	0.7	=	173.37	(77)
Southeast 0.9x 0	.77 ×	8.	19	x	4	4.07	X		0.63	×	0.7	=	110.31	(77)
Southeast 0.9x 0	.77 ×	8.	19	x	3	1.49	X		0.63	×	0.7	=	78.81	(77)
Southwest _{0.9x} 0	.77 ×	0.	55	x	3	6.79			0.63	X	0.7	=	6.18	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	x	6	2.67			0.63	×	0.7	=	10.53	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	X	8	5.75			0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x} 0	.77 ×	0.	55	x	10	6.25			0.63	X	0.7	=	17.86	(79)
	.77 ×	0.	55	x	11	9.01			0.63	X	0.7	=	20	(79)
	.77 ×	0.	55	x	11	8.15			0.63	×	0.7	=	19.86	(79)
	.77 ×	0.	55	x	11	3.91			0.63	×	0.7	=	19.15	(79)
	.77 ×	0.	55	x	10	4.39			0.63	X	0.7	=	17.55	(79)
	.77 ×	0.	55	X	9:	2.85			0.63	X	0.7	=	15.61	(79)
	.77 ×	0.	55	x	6	9.27			0.63	×	0.7	=	11.64	(79)
	.77 ×	0.	55	x	4	4.07			0.63	×	0.7	=	7.41	(79)
	.77 ×	0.	55	x	3	1.49			0.63	×	0.7	=	5.29	(79)
	.77 ×	7.	55	X	1	1.28	X		0.63	X	0.7	=	26.03	(81)
	.77 ×	7.	55	x	2:	2.97	X		0.63	×	0.7	=	52.99	(81)
	.77 ×	7.	55	x	4	1.38	X		0.63	×	0.7	=	95.48	(81)
	.77 ×	7.	55	x	6	7.96	X		0.63	X	0.7	=	156.8	(81)
	.77 ×	7.	55	x	9	1.35	X		0.63	X	0.7	=	210.77	(81)
	.77 ×	7.	55	x	9	7.38	x		0.63	X	0.7	=	224.7	(81)
	.77 ×	7.	55	x	9	1.1	x		0.63	X	0.7	=	210.2	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	7:	2.63	x		0.63	X	0.7	=	167.58	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	5	0.42	x		0.63	X	0.7	=	116.34	(81)
Northwest 0.9x 0	.77 ×	7.	55	X	2	3.07	X		0.63	X	0.7	=	64.76	(81)

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x	0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x	0.63	x [0.7	=	21.26	(81)
Rooflights 0.9x	1	X	1.0)1	x	16.37	_ x [0.63	x [0.7	=	6.56	(82)
Rooflights 0.9x	1	X	1.0)1	x	33.68	x	0.63	x	0.7	=	13.5	(82)
Rooflights 0.9x	1	X	1.0)1	x	62.13	x [0.63	x [0.7	=	24.91	(82)
Rooflights 0.9x	1	x	1.0)1	X ·	104.87	×	0.63	×	0.7	=	42.04	(82)
Rooflights 0.9x	1	x	1.0)1	X ·	143.66	×	0.63	×	0.7	=	57.59	(82)
Rooflights 0.9x	1	X	1.0)1	X ·	154.33	×	0.63	×	0.7	=	61.87	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.9	×	0.63	×	0.7	=	57.69	(82)
Rooflights 0.9x	1	x	1.0)1	X ·	113.05	x	0.63	x	0.7	=	45.32	(82)
Rooflights 0.9x	1	x	1.0)1	x	76.56	x	0.63	x	0.7	=	30.69	(82)
Rooflights 0.9x	1	x	1.0)1	x	41.49	x	0.63	x	0.7	=	16.63	(82)
Rooflights 0.9x	1	X	1.0)1	x	20.65	×	0.63	x	0.7		8.28	(82)
Rooflights 0.9x	1	x	1.0)1	x	13.34	x	0.63	x	0.7	=	5.35	(82)
							_						
Solar gains i	n watts, ca	alculated	for eacl	h month			(83)m :	= Sum(74)m .	(82)m			_	
(83)m= 130.8		349.43	482.64	586.24	602.16		491.7	395.04	266.41	158.75	110.71		(83)
Total gains –	· internal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts	1	•		, 		1	
(84)m= 544.59	9 645.45	746.27	855.42	934.48	926.81	881.95	808.3	724.42	620.07	539.81	512.25		(84)
7. Mean inte	ernal temp	perature ((heating	season)								
Temperatur	e during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
								` ,					
Utilisation fa	actor for g	ains for I	iving are	ea, h1,m	(see T	able 9a)		. ,					
Utilisation fa		ains for I Mar	iving are Apr	ea, h1,m May	(see Ta	able 9a) Jul	Au		Oct	Nov	Dec		
					<u> </u>	1	1	g Sep	Oct 0.94	Nov 0.98	Dec 0.99		(86)
(86)m= Jan 0.99	Feb 0.98	Mar 0.96	Apr 0.91	May 0.82	Jun 0.66	Jul 0.52	Au 0.58	g Sep					(86)
Jan	Feb 0.98	Mar 0.96	Apr 0.91	May 0.82	Jun 0.66	Jul 0.52	Au 0.58	g Sep 0.8 able 9c)					(86)
(86)m= 0.99 Mean intern (87)m= 19.08	0.98 all temper	0.96 ature in 1	Apr 0.91 living are 20.19	May 0.82 ea T1 (fo 20.6	Jun 0.66 ollow ste 20.87	Jul 0.52 eps 3 to 7 20.96	Au 0.58 7 in Ta 20.9	g Sep 3 0.8 able 9c) 4 20.73	0.94	0.98	0.99		
(86)m= 0.99 Mean intern	Feb 0.98 nal temper 19.32 re during h	0.96 ature in 1	Apr 0.91 living are 20.19	May 0.82 ea T1 (fo 20.6	Jun 0.66 ollow ste 20.87	Jul 0.52 eps 3 to 7 20.96	Au 0.58 7 in Ta 20.9	g Sep 0.8 able 9c) 4 20.73	0.94	0.98	0.99		
(86)m= 0.99 Mean intern (87)m= 19.08 Temperatur (88)m= 19.86	Feb 0.98 all temper 19.32 e during h	Mar 0.96 rature in l 19.69 neating p	Apr 0.91 living are 20.19 eriods ir 19.88	May 0.82 ea T1 (for 20.6 n rest of 19.88	Jun 0.66 Dillow ste 20.87 dwelling	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89	Au 0.58 7 in Ta 20.9 able 9,	g Sep 0.8 able 9c) 4 20.73	0.94	0.98	0.99		(87)
Jan (86)m= 0.99	Feb 0.98 all temper 19.32 e during here 19.86 actor for g	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r	Apr 0.91 living are 20.19 eriods ir 19.88	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling,	Jun 0.66 bllow ste 20.87 dwelling 19.89 h2,m (s	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table	Au 0.58 7 in Ta 20.9 able 9, 19.9	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89	0.94 20.18 19.88	0.98 19.55	0.99 19.05		(87)
Jan 0.99	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 19.89	0.94 20.18 19.88	0.98	0.99		(87)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper	Mar 0.96 eature in language in 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelli	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 f	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 0 19.89 0 0.73	0.94 20.18 19.88 0.92 e 9c)	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99		(87) (88) (89)
Jan 0.99	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 0 19.89 c 7 in Table 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99		(87) (88) (89) (90)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper	Mar 0.96 eature in language in 19.69 neating p 19.86 ains for r 0.95	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelli	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 f	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 0 19.89 c 7 in Table 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99	0.27	(87) (88) (89)
Jan	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47	Jun 0.66 Dllow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 1	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 0 19.89 0 7 in Table 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47	Jun 0.66 Dllow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 1	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 9 19.89 6 0.73 to 7 in Tabl 6 19.65	0.94 20.18 19.88 0.92 e 9c) 18.92	0.98 19.55 19.88 0.98	0.99 19.05 19.87 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to the	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2 ature (fo	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91 r the wh	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78	Jun 0.66 collow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 20.08	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87 fLA × T1 20.17	Au 0.58 7 in Ta 20.9 able 9, 19.9 9a) 0.46 eps 3 1 19.8 + (1 - 20.1)	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 0 19.89 6 0.73 to 7 in Tabl 6 19.65 f -fLA) × T2 6 19.94	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4	0.99 19.05 19.87 0.99 17.27	0.27	(87) (88) (89) (90) (91) (92)
Jan 0.99	Feb 0.98 al temper 19.32 e during h 19.86 actor for g 0.98 al temper 17.66 al temper 18.11 tment to t 17.96	Mar 0.96 ature in 1 19.69 neating p 19.86 ains for r 0.95 ature in 1 18.2 ature (fo 18.61 he mean	Apr 0.91 living are 20.19 eriods ir 19.88 rest of de 0.89 the rest 18.91 r the wh	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78	Jun 0.66 collow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 20.08	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87 fLA × T1 20.17	Au 0.58 7 in Ta 20.9 able 9, 19.9 0.46 eps 3 f 19.8 + (1 - 20.1)	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 9 19.89 0.73 to 7 in Tabl 6 19.65 f-fLA) × T2 6 19.94 where approximations	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4	0.99 19.05 19.87 0.99 17.27	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to	Mar 0.96 eature in langle 19.86 ains for rature in tale 18.2 eature (for 18.61) he mean 18.46 uirement	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelli 19.47 cole dwe 19.78 I temper 19.63	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 20.08 ature fre 19.93	Jul	Au 0.58 7 in Ta 20.9 able 9, 19.9 0.46 eps 3 t 19.8 + (1 - 20.1) 2 4e, w 20.0	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 9 19.89 0.73 to 7 in Tabl 6 19.65 f -fLA) × T2 6 19.94 where approx	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4) 18.43	0.99 19.05 19.87 0.99 17.27 17.76		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.99 Mean intern (87)m= 19.08 Temperatur (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean intern (90)m= 17.32 Mean intern (92)m= 17.8 Apply adjus (93)m= 17.65 8. Space he Set Ti to the	Feb 0.98 19.32 e during h 19.86 actor for g 0.98 al temper 17.66 al temper 18.11 tment to to 17.96 e mean interpretations requires the second requires the sec	Mar 0.96 ature in 1 19.69 19.86 ains for r 0.95 ature in 1 18.2 ature (fo 18.61 he mean 18.46 uirement ternal ternal ternal	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78 I temper 19.63	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 20.08 ature fre 19.93	Jul	Au 0.58 7 in Ta 20.9 able 9, 19.9 0.46 eps 3 t 19.8 + (1 - 20.1) 2 4e, w 20.0	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 9 19.89 0.73 to 7 in Tabl 6 19.65 f -fLA) × T2 6 19.94 where approx	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4) 18.43	0.99 19.05 19.87 0.99 17.27 17.76		(87) (88) (89) (90) (91) (92)
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Mean intern (92)m= 17.85 Mean intern (93)m= 17.65 Set Ti to the the utilisation for the utilisation for the formula intern (92)m for the utilisation for the utilisation for the utilisation for the unitern (92)m for the utilisation for the utili	Feb 0.98 all temper 19.32 e during h 19.86 actor for g 0.98 all temper 17.66 all temper 18.11 tment to to to for general interper e mean interper for for general interper Feb	Mar 0.96 ature in langle	Apr 0.91 living are 20.19 eriods ir 19.88 rest of do 0.89 the rest 18.91 r the wh 19.26 internal 19.11 mperaturusing Ta Apr	May 0.82 ea T1 (for 20.6 n rest of 19.88 welling, 0.77 of dwelling 19.47 ole dwe 19.78 I temper 19.63 re obtain able 9a	Jun 0.66 ollow ste 20.87 dwelling 19.89 h2,m (s 0.58 ng T2 (19.79 lling) = 20.08 ature free 19.93	Jul 0.52 eps 3 to 7 20.96 g from Ta 19.89 ee Table 0.4 follow ste 19.87 fLA × T1 20.17 om Table 20.02 tep 11 of	Au 0.58 7 in Ta 20.9 able 9, 19.9 0.46 eps 3 f 19.8 + (1 - 20.1) 20.0 Table	g Sep 0.8 able 9c) 4 20.73 Th2 (°C) 0 19.89 0.73 to 7 in Table 6 19.65 f -fLA) × T2 6 19.94 where appro 1 19.79 e 9b, so that	0.94 20.18 19.88 0.92 e 9c) 18.92 LA = Livi 19.26 ppriate 19.11 t Ti,m=	0.98 19.55 19.88 0.98 18.01 ng area ÷ (4 18.43 18.28 (76)m and	0.99 19.05 19.87 0.99 17.27 17.76 17.61 d re-calc		(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m			
(95)m= 533.93 623.75 699.72 746.97 706.62 540.06 367.83 381.4 523.28 562.66 522.61	503.94		(95)
Monthly average external temperature from Table 8	4.0		(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 1535.61 1497.79 1367.68 1151.11 891.75 592.45 379.75 399.69 635.52 957.67 1263.78	1524.49		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	1324.49		(37)
(98)m= 745.25 587.35 496.96 290.98 137.74 0 0 0 0 293.89 533.64	759.29		
Total per year (kWh/year) = Sum(98		3845.1	(98)
	//15,912]
Space heating requirement in kWh/m²/year	Į	42.69	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)			
Space heating:	Г		1,,,,,
Fraction of space heat from secondary/supplementary system	ļ	0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$	ļ	1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		1	(204)
Efficiency of main space heating system 1		90.4	(206)
Efficiency of secondary/supplementary heating system, %	Ī	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec	kWh/yea	ır
Space heating requirement (calculated above)		,	
745.25 587.35 496.96 290.98 137.74 0 0 0 0 293.89 533.64	759.29		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)			(211)
824.39 649.73 549.74 321.88 152.36 0 0 0 0 325.1 590.31	839.92		
Total (kWh/year) =Sum(211) _{15,1012}	:	4253.43	(211)
Space heating fuel (secondary), kWh/month			_
= {[(98)m x (201)] } x 100 ÷ (208)			
(215)m= 0 0 0 0 0 0 0 0 0 0 0	0		
Total (kWh/year) =Sum(215) _{15,1012} =	:	0	(215)
Water heating			
Output from water heater (calculated above)			
98.19 83.02 91.37 78.84 102.91 142.33 136.42 152.08 153.77 85.35 88.82	94.69		7
Efficiency of water heater		80.3	(216)
(217)m= 89.1 89.01 88.67 88.04 85.79 80.3 80.3 80.3 87.91 88.81	89.16		(217)
Fuel for water heating, kWh/month			
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 110.21 93.27 103.04 89.55 119.97 177.24 169.89 189.39 191.49 97.08 100.02 $	106.21		
Total = Sum(219a) _{1,-12} =		1547.35	(219)
Annual totals kWh/year	L	kWh/year	(= : •)
Space heating fuel used, main system 1	[4253.43]
Water heating fuel used	[1547.35]
-	L	10.17.00	J
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 o	of (230a)(230g) =	75 (231)
Electricity for lighting			380.53 (232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =	:	6256.31 (338)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	918.74 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	334.23 (264)
Space and water heating	(261) + (262) + (263) + (263)	64) =	1252.97 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519	197.49 (268)
Total CO2, kg/year		sum of (265)(271) =	1489.39 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	16.53 (273)

El rating (section 14)

(274)



Appendix C

Generating energy on-site:-

Final SAP Outputs & Dwelling Emission Rates

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:57:17

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -GREEN

Plot Reference: Sample 1

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.96 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.48 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) **OK** Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 8.5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.47 kWh/day

Permitted by DBSCG: 2.24 kWh/day

OK

Primary pipework insulated:	Yes		ок
6 Controls			
Space heating controls	TTZC by plumbing and e	ectrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle	ey):	Medium	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: North West		7.55m²	
Windows facing: South East		8.19m²	
Windows facing: South West		0.55m²	
Roof windows facing: North W	est	1.01m²	
Ventilation rate:		4.00	
10 Key features		0.40.004	
Roofs U-value		0.12 W/m²K	
Party Walls U-value		0 W/m²K	

Photovoltaic array

			User D	etails:						
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12		Softwa	are Vei	sion:		Versio	n: 1.0.5.41	
		Р	roperty ,	Address	: Sample	e 1				
Address:	a atau a									
Overall dwelling dime	nsions:		Aros	a(m²)		Av. Hei	iaht(m)		Volume(m³)	\ \
Ground floor				3.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			3	3.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor			2	23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 9	0.08	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + [0	j = [0	x	20 =	0	(6b)
Number of intermittent far	ns					3	x -	10 =	30	(7a)
Number of passive vents					Ī	0	x -	10 =	0	(7b)
Number of flueless gas fir	res					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s flues and fans = (6a)+(6b)+(7	'a)+(7b)+(7c) =	г	30		÷ (5) =	0.13	(8)
If a pressurisation test has be					continue fr			- (3) –	0.13	(6)
Number of storeys in th	ne dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.					•	uction			0	(11)
if both types of wall are producting areas of openin		sponding to	the great	er wall are	a (after					
If suspended wooden fl		led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	! x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = ((16)				0.38	(18)
Air permeability value applies		s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltere	d			(20) - 1	[0.075 x (1	0)1 -			0	(19)
Shelter factor	to a challent a to			,	`	9)] -			1	(20)
Infiltration rate incorporati	-	d		(21) = (18) x (20) =				0.38	(21)
Infiltration rate modified for			Jul	۸۰۰۰	Son	Oct	Nov	Dec		
		Jun	Jui	Aug	Sep	OCI	INOV	l Dec		
Monthly average wind spo		20	20	27	1	4.3	1 F	17		
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Fa	actor (2	2a)m =	(22)m ÷	4				•		•		,			
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	ation rate	e (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m						
[0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45			
		<i>tive air</i> d al ventila	•	rate for t	he appli	cable ca	se							0	(23a
_				endix N, (2	.3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)				0	(23b
If balaı	nced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (fror	n Table 4h) =					0	(23c
a) If b	oalance	d mecha	anical ve	entilation	with hea	at recov	ery (MV	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 b	palance	d mecha	anical ve	entilation	without	heat red	covery (I	MV) (24b)m = (2:	2b)m + (23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b
,					•	•		on from o							
Г	<u> </u>			· ·	ŕ		<u> </u>	c) = (22b	 	· ·	<u> </u>		ı		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,					•			on from I 0.5 + [(2		0.51					
(24d)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]		(24d
` ′ L								ld) in box					l		Ì
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6			(25)
0 11	. ()				<u>l</u>	<u> </u>				<u> </u>			l		
ਤ. ਜea	ar insse														
				paramet Openin		Not Ar	-02	l I_valı	10	ΔΥΠ		k_value	<u>.</u>	ΔΥ	k
ELEM		Gros area	ss	paramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	<)	k-value kJ/m²·ł		A X kJ/K	
		Gros	ss	Openin	gs		m²			_	<) 				
ELEM	ENT	Gros area	ss	Openin	gs	A ,r	m² x	W/m2	2K =	(W/	<) 				
ELEM Doors	I ENT vs Type	Gros area	ss	Openin	gs	A ,r	m ² x x1	W/m2	eK = 0.04] =	(W/ 2.736	<) 				(26)
ELEM Doors Window	IENT vs Type vs Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55	m ² x x1 x1	W/m2 1.2 /[1/(1.2)+	0.04] =	(W/) 2.736 8.65	<) 				(26)
ELEM Doors Window Window	VS Type VS Type VS Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38	<)				(26) (27) (27)
ELEM Doors Window Window Window	VS Type VS Type VS Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38 0.63					(26) (27) (27) (27)
Doors Window Window Window Roofligh	VS Type VS Type VS Type VS Type hts	Gros area	es (m²)	Openin	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	x1 x1 x1 x1 x1 x1	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212		kJ/m²·l		kJ/K	(26) (27) (27) (27) (27b)
ELEM Doors Window Window Window Roofligh Floor	vs Type vs Type vs Type hts	Gros area 1 2 2	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676		kJ/m²·l		kJ/K 3667.4	(26) (27) (27) (27) (27b) (28)
Doors Window Window Window Roofligh Floor Walls T	vs Type vs Type vs Type hts ype1 ype2	Gros area 1 2 2 3	68 2	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18	0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		410 60		3667.4 6606.6	(26) (27) (27) (27) (27b (28) (29)
Doors Window Window Roofligh Floor Walls T	vs Type vs Type vs Type hts ype1 ype2 ype1	Gros area 1 2 3 128.6	68 2 9 9	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62	X X1 X1 X1 X1 X X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		110 60 9		3667.4 6606.6 59.58	(26) (27) (27) (27) (27b (28) (29)
Doors Window Window Roofligh Floor Walls T Walls T Roof T	vs Type vs Type vs Type hts ype1 ype2 ype1 ype2	Gros area 1 2 3 128.6 6.62 25.5	68 2 9	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	X X1 X1 X1 X1 X X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95		110 60 9		3667.4 6606.6 59.58 221.22	(26) (27) (27) (27) (27b (28) (29) (29) (30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T	vs Type vs Type vs Type hts ype1 ype2 ype1 ype2 ype3	Gros area 1	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22	X X1 X1 X1 X1 X1 X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98	(26) (27) (27) (27) (27b (28) (29) (29) (30) (30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T	vs Type vs Type thts Type1 Type2 Type2 Type3 Type3 Type3 of e	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98	(26) (27) (27) (27) (27b (28)](29)](29)](30)](30)
Doors Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T Total ar	vs Type vs Type vs Type thts ype1 ype2 ype1 ype2 ype3 rea of e	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27b (28)](29)](30)](30) (31)](32)
ELEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Roof T Total ar Party w	vs Type vs Type vs Type thts Type1 Type2 Type2 Type3 Type3 Trea of e vall I wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27) (28)](29)](30)](30) (31)
ELEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Total ar Party w Internal	vs Type vs Type vs Type hts ype1 ype2 ype3 rea of e vall I wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48 1766.7 859.5	(26) (27) (27) (27) (27b (28)](29)](30)](30) (31)](32)](32c
CLEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Roof T rotal ar Party w nternal nternal	vs Type vs Type vs Type thts Type1 Type2 Type3 rea of e vall I wall ** I floor I ceiling	Gros area 1 2 3 128.6 6.62 25.5 6.22 3.72 Ilements	68 2 9 2 2 , m²	18.5 0 1.01 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.3 ² 110.1 6.62 24.58 6.22 3.72 204.1 39.26 95.5 56.7 ²	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	eK = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62 0.34		110 60 9 9 9 9 18 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27) (28)](29)](30) [(30) (31)](32)](32)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

52.14

(33)

Heat capacity	cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	14802.44	(34)
Thermal mass		. ,	P = Cm ÷	· TFA) in	n kJ/m²K			= (34)	÷ (4) =			164.33	(35)
For design asses	•	`		,			ecisely the	indicative	values of	TMP in Ta	able 1f	104.00	(00)
can be used inste	ead of a de	tailed calcu	ulation.			·	·						
Thermal bridg	ges : S (L	x Y) cal	culated ι	using Ap	pendix I	K						17.27	(36)
if details of therm	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he	eat loss							(33) +	(36) =			69.41	(37)
Ventilation he	at loss ca	alculated	monthly	У	_	_		(38)m	= 0.33 × (25)m x (5)		•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 45.62	45.28	44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer	coefficier	nt, W/K			•			(39)m	= (37) + (3	38)m		•	
(39)m= 115.03	114.69	114.35	112.77	112.48	111.1	111.1	110.85	111.63	112.48	113.08	113.7		
Heat loss para	ameter (F		/m²K		•	•			Average = = (39)m ÷	` '	12 /12=	112.77	(39)
(40)m= 1.28	1.27	1.27	1.25	1.25	1.23	1.23	1.23	1.24	1.25	1.26	1.26		
(10)	1/	1.27	1.20	1.20	1.20	1.20	120		Average =			1.25	(40)
Number of da	ys in moi	nth (Tabl	le 1a)					,	werage	Odm(40)1.	12712	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)
		<u> </u>			<u>[</u>	<u> </u>							
4 Water bea	ting one	~~									LAMb /v	2011	
4. Water hea	aung ener	rgy requi	rement.								kWh/y	dar.	
Assumed occ if TFA > 13			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	ΓFA -13.		63		(42)
if TFA > 13. if TFA £ 13.	.9, N = 1 .9, N = 1	+ 1.76 x	-		·		, , -		ΓFA -13.		63		(42)
if TFA > 13. if TFA £ 13. Annual avera	.9, N = 1 .9, N = 1 ge hot wa	+ 1.76 x ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		9)	.59		(42)
if TFA > 13. if TFA £ 13.	.9, N = 1 .9, N = 1 ge hot wa al average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)			` ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125.	.9, N = 1 .9, N = 1 ge hot wa lal average 5 litres per l	+ 1.76 x ater usag	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av lwelling is not and co	erage = designed t ld)	(25 x N) o achieve	+ 36 a water us	e target o	9) 96	.59		` ,
if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 129 Jan	.9, N = 1 .9, N = 1 ge hot wa lal average 5 litres per l	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36		9)			` ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	9, N = 1 9, N = 1 ge hot water a large sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d rater use, f May Vd,m = fac	ay Vd,av	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43)	+ 36 a water us Sep	e target of	9) 96 Nov	.59 Dec		` ,
if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 129 Jan	9, N = 1 9, N = 1 ge hot water a large sper per per per per per per per per per	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us Sep	Oct 98.52	9) 96 Nov 102.38	.59 Dec 106.25	1150.04	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	9, N = 1 9, N = 1 ge hot was all average filtres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar r day for ea	ge in litre usage by s day (all w Apr ach month 94.66	es per da 5% if the d vater use, h May Vd,m = fac 90.79	ay Vd,av lwelling is not and co. Jun ctor from 7	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Fotal = Sui	9) Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	` ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea	ge in litre usage by s day (all w Apr ach month 94.66	es per da 5% if the d vater use, h May Vd,m = fac 90.79	ay Vd,av lwelling is not and co. Jun ctor from 7	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Fotal = Sui	9) Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56	9, N = 1 9, N = 1 ge hot water sper properties per	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4.	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Suith (see Tai	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04 1519.69	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of	9, N = 1 9, N = 1 ge hot water sper properties per	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4.	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous (46)m= 23.63	9, N = 1 9, N = 1 ge hot water later sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4.	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous (46)m= 23.63 Water storage	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar aday for ear 98.52 used - calc 142.2 ng at point 21.33	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the d ater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93 190 x Vd,r 102.65	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79 77m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ =	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous (46)m= 23.63 Water storage Storage voluments	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2 ng at point 21.33 including	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the dater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 plar or W	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage),	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volume If community	9, N = 1 9, N = 1 ge hot water sper in litres per in litres per in 102.38 102.38 102.38 water heating 20.67 e loss: me (litres)	the table of the table of the table of	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volume If community of Otherwise if not 150.	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	the table of the table of the table of	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous if (46)m= 23.63 Water storage Storage volumed If community of the water storage if in water storage if in water storage if in water storage.	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar 98.52 used - calc 142.2 ng at point 21.33 including and no tal hot water	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (not 18.6 ag any so unk in dw er (this in	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volunt of Community of	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar 98.52 used - calce 142.2 ang at point 21.33 includinate hot water person per and no talce eclared legerate and the colored legerate and the co	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no 18.6 ag any so ank in dw er (this in	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous is (46)m= 23.63 Water storage Storage volum If community of the wise if in Water storage a) If manufact Temperature	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	the trust of trust	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (not 18.6 and any so ank in dw er (this in oss facto 2b	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 color or W relling, e facludes in or is known	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS nter 110 nstantar	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47) ombi boil	+ 36 a water us Sep 94.66 0 kWh/more 110.45 0 to (61) 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89 200		(43) (44) (45) (46) (47) (48) (49)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volunt of Community of	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	the trust of trust of the trust of	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no 18.6 ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the d ater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e acludes in or is knowear	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS inter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage 0 litres in neous con/day):	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 0 to (61) 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)

Hot water stor	rage loss	factor fr	om Tabl	le 2 (kW	h/litre/da	ıy)					0		(51)
If community	•		on 4.3									•	
Volume factor											0		(52)
Temperature	tactor tro	m Table	2b								0		(53)
Energy lost fro		-	, kWh/ye	ear			(47) x (51)	x (52) x ((53) =	-	0		(54)
Enter (50) or	. , .	•								0.	79		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m	_	_		
(56)m= 24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(56)
If cylinder contain	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
Primary circui	t loss (an	nual) fro	om Table	e 3							0		(58)
Primary circui	t loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor fi	rom Tab	le H5 if t	here is s	olar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss ca	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 he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 205.43	181.04	190.07	170.3	166.83	148.98	142.99	157.02	156.78	176.59	186.84	200.46		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 113.77	102.9	102.79	92.49	70.26	3.19	2.99	3.34	3.37	94.36	102.93	112.14	ı	(63) (G2)
Output from w	<i>ı</i> ater hea	tor											
-	78.14	87.28	77.81	96.56	145.78	140	153.68	153.41	82.23	83.91	88.31		
	1	·	77.81	96.56	145.78	140			82.23 ater heate			1278.78	(64)
(64)m= 91.66	78.14	87.28					Outp	out from w	ater heate	I r (annual)₁	12		(64)
(64)m= 91.66 Heat gains from	78.14	87.28					Outp	out from w	ater heate	I r (annual)₁	12		(64) (65)
(64)m= 91.66 Heat gains fro (65)m= 90.68	78.14 om water 80.41	87.28 heating, 85.58	kWh/mo	onth 0.2:	5 ´ [0.85 71.19	× (45)m	Outr + (61)m 74.59	out from word + 0.8	ater heate x [(46)m	+ (57)m 83.78	+ (59)m 89.03]	1
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57)	78.14 om water 80.41 om in cald	heating, 85.58 culation o	kWh/mo 78.28 of (65)m	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outr + (61)m 74.59	out from word + 0.8	ater heate x [(46)m	+ (57)m 83.78	+ (59)m 89.03]	1
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal g	78.14 om water 80.41 om in calc ains (see	heating, 85.58 culation of	kWh/mo 78.28 of (65)m 5 and 5a	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outr + (61)m 74.59	out from word + 0.8	ater heate x [(46)m	+ (57)m 83.78	+ (59)m 89.03]	1
Heat gains from (65)m= 90.68 include (57) 5. Internal gains Metabolic gain	78.14 om water 80.41 om in calc ains (see	heating, 85.58 culation (e Table 5	kWh/mo 78.28 of (65)m 5 and 5a	onth 0.2: 77.85 only if c	5 ´ [0.85 71.19 ylinder is	× (45)m 69.92 s in the o	Outp + (61)m 74.59 dwelling	73.79 or hot w	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	1
Heat gains from (65)m= 90.68 include (57) 5. Internal grade Metabolic gain Jan	78.14 om water 80.41 om in calc ains (see ns (Table Feb	heating, 85.58 culation of Table 5 5), Wat Mar	kWh/mo 78.28 of (65)m 5 and 5a ts Apr	onth 0.25 77.85 only if constant	5 ´ [0.85 71.19 ylinder is Jun	× (45)m 69.92 s in the o	Outs + (61)m 74.59 dwelling	out from w. 1] + 0.8 x 73.79 or hot w	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	(65)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gain Metabolic gain Jan (66)m= 131.34	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34	heating, 85.58 culation (Table 5 5), Wat Mar 131.34	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34	onth 0.23 77.85 only if co): May	5 ´ [0.85 71.19 ylinder is Jun 131.34	× (45)m 69.92 s in the o	Outp + (61)m 74.59 dwelling Aug 131.34	out from w 73.79 or hot w Sep 131.34	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	1
Heat gains from (65)m= 90.68 include (57) 5. Internal grade Metabolic gain Jan (66)m= 131.34 Lighting gains	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 c (calcula	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34	onth 0.29 77.85 only if co May 131.34 L, equat	5 ´ [0.85 71.19 ylinder is Jun 131.34 ion L9 o	× (45)m 69.92 s in the o Jul 131.34 r L9a), a	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see	Sep 131.34 Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34	+ (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gradient Jan (66)m= 131.34 Lighting gains (67)m= 21.55	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mc 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.25 77.85 only if co May 131.34 L, equat 8.81	5 ´ [0.85 71.19 ylinder is Jun 131.34 ion L9 or	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03	Outs + (61)m 74.59 dwelling Aug 131.34 Iso see	Sep 131.34 Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	(65)
Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78	onth 0.25 77.85 only if co May 131.34 L, equat 8.81 dix L, eq	Jun 131.34 ion L9 or 7.44 uation L	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5	(annual) ₁ + (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65) (66) (67)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22	78.14 om water 80.41 om in calc ains (see Feb 131.34 6 (calcular 19.14 ains (calc 241.71	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Appendix 222.13	onth 0.2: 77.85 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	Oct 131.34 17.8 ble 5 196.06	+ (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies Jan (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains	78.14 om water 80.41 om in calc ains (see 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula	heating, 85.58 culation of the Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mc 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Append 222.13 ppendix	onth 0.23 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se	Sep 131.34 Table 5 14.02 see Table Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in A 36.13	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 77.85 only if co : May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65) (66) (67)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies and (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13 Pumps and face (64)m= 21.55 Appliances gains (65)m= 239.22 Cooking gains (65)m= 36.13 Appliances gains (65)m= 36.13	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated ir 235.45 tted in A 36.13 (Table 5	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.23 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se	Sep 131.34 Table 5 14.02 see Table Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68) (69)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in A 36.13	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.23 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se	Sep 131.34 Table 5 14.02 see Table Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies and (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13 Pumps and face (64)m= 21.55 Appliances gains (65)m= 239.22 Cooking gains (65)m= 36.13 Appliances gains (65)m= 36.13	78.14 om water 80.41 om in calc ains (see ns (Table 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ans gains 0	heating, 85.58 culation of the Table 5 5), Wate Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in Ap 36.13 (Table 5	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 0 tive valu	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 See Ta 182.74 ee Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies Jan (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13 Pumps and factorion (70)m= 0	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 6 (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ans gains 0 vaporatio	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in Ap 36.13 (Table 5	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 See Ta 182.74 ee Table 36.13	A column	(annual), + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (69)m= 36.13 Pumps and factorion (70)m= 0 Losses e.g. e	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ans gains 0 vaporatio -105.07	heating, 85.58 culation of Table 5 5), Wate Mar 131.34 ted in Ap 15.56 ulated in 235.45 ated in A 36.13 (Table 5 on (negation)	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 0 tive valu	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ans gains 0 vaporatio -105.07	heating, 85.58 culation of Table 5 5), Wate Mar 131.34 ted in Ap 15.56 ulated in 235.45 ated in A 36.13 (Table 5 on (negation)	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 0 tive valu	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal	gains =	:				(66)	m + (67)m	+ (68	3)m + ((69)m + (1	70)m +	(71)m + (72)	m		
(73)m= 445.06	442.9	428.44	405.04	381.17	35	58.24	343.39	349	.59	361.64	385.26	3 412.41	432.88		(73)
6. Solar gain	s:														
Solar gains are		_			and			tions	to con	vert to the	e applic		ion.		
Orientation: /	Access F Fable 6d	actor	Area m²			Flu Tal	x ole 6a			g_ ible 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	X	8.	19	x	3	6.79	x		0.63	x	0.7	=	92.09	(77)
Southeast _{0.9x}	0.77	X	8.	19	x	6	2.67	x		0.63	x	0.7	=	156.87	(77)
Southeast 0.9x	0.77	X	8.	19	x	8	5.75	X		0.63	×	0.7	=	214.64	(77)
Southeast 0.9x	0.77	X	8.	19	X	10	06.25	X		0.63	x	0.7	=	265.94	(77)
Southeast 0.9x	0.77	X	8.	19	x	1	19.01	x		0.63	x	0.7	=	297.88	(77)
Southeast _{0.9x}	0.77	X	8.	19	X	1	18.15	x		0.63	x	0.7	=	295.73	(77)
Southeast 0.9x	0.77	X	8.	19	X	1	13.91	X		0.63	x	0.7	=	285.11	(77)
Southeast _{0.9x}	0.77	X	8.	19	X	1	04.39	X		0.63	x	0.7	=	261.29	(77)
Southeast _{0.9x}	0.77	X	8.	19	X	9	2.85	X		0.63	X	0.7	=	232.41	(77)
Southeast _{0.9x}	0.77	X	8.	19	X	6	9.27	X		0.63	x	0.7	=	173.37	(77)
Southeast 0.9x	0.77	X	8.	19	X	4	4.07	X		0.63	×	0.7	=	110.31	(77)
Southeast 0.9x	0.77	X	8.	19	X	3	1.49	X		0.63	X	0.7	=	78.81	(77)
Southwest _{0.9x}	0.77	X	0.8	55	X	3	6.79			0.63	x	0.7	=	6.18	(79)
Southwest _{0.9x}	0.77	X	0.8	55	Х	6	2.67			0.63	×	0.7	=	10.53	(79)
Southwest _{0.9x}	0.77	X	0.8	55	Х	8	5.75			0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	10	06.25			0.63	x	0.7	=	17.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	Х	1	19.01			0.63	x	0.7	=	20	(79)
Southwest _{0.9x}	0.77	X	0.8	55	Х	1	18.15			0.63	X	0.7	=	19.86	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	1	13.91			0.63	x	0.7	=	19.15	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	10	04.39			0.63	×	0.7	=	17.55	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	9	2.85			0.63	X	0.7	=	15.61	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	6	9.27			0.63	x	0.7	=	11.64	(79)
Southwest _{0.9x}	0.77	X	0.8	55	X	4	4.07			0.63	×	0.7	=	7.41	(79)
Southwest _{0.9x}	0.77	X	0.5	55	Х	3	1.49			0.63	X	0.7	=	5.29	(79)
Northwest 0.9x	0.77	Х	7.5	55	X	1	1.28	X		0.63	X	0.7	=	26.03	(81)
Northwest 0.9x	0.77	X	7.5	55	X	2	2.97	X		0.63	×	0.7	=	52.99	(81)
Northwest 0.9x	0.77	X	7.5	55	X	4	1.38	X		0.63	X	0.7	=	95.48	(81)
Northwest 0.9x	0.77	X	7.5	55	X	6	7.96	X		0.63	X	0.7	=	156.8	(81)
Northwest 0.9x	0.77	X	7.5	55	X	9	1.35	X		0.63	×	0.7	=	210.77	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	9	7.38	X		0.63	x	0.7	=	224.7	(81)
Northwest 0.9x	0.77	X	7.5	55	X	(91.1	X		0.63	X	0.7	=	210.2	(81)
Northwest 0.9x	0.77	X	7.5	55	X	7	2.63	x		0.63	X	0.7	=	167.58	(81)
Northwest 0.9x	0.77	X	7.5	55	X	5	0.42	x		0.63	X	0.7	=	116.34	(81)
Northwest _{0.9x}	0.77	X	7.	55	X	2	8.07	X		0.63	×	0.7	=	64.76	(81)

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x	0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x	0.63	×	0.7	=	21.26	(81)
Rooflights 0.9x	1	X	1.0)1	x	16.37	_ x [0.63	x	0.7		6.56	(82)
Rooflights 0.9x	1	X	1.0)1	x	33.68	x	0.63	x	0.7	=	13.5	(82)
Rooflights 0.9x	1	X	1.0)1	x	62.13	x [0.63	x	0.7	-	24.91	(82)
Rooflights 0.9x	1	x	1.0)1	x	104.87	×	0.63	x	0.7	=	42.04	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.66	x	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	x	1.0)1	x	154.33	x	0.63	x	0.7	-	61.87	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.9	×	0.63	×	0.7	=	57.69	(82)
Rooflights 0.9x	1	x	1.0)1	x	113.05	x	0.63	x	0.7	_	45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	×	0.63	x	0.7	_	30.69	(82)
Rooflights 0.9x	1	x	1.0)1	x	41.49	x	0.63	X	0.7	-	16.63	(82)
Rooflights 0.9x	1	X	1.0)1	x	20.65	×	0.63	x	0.7	_	8.28	(82)
Rooflights 0.9x	1	x	1.0)1	x	13.34	x	0.63	x	0.7	_	5.35	(82)
							_						
Solar gains ir	watts, ca	alculated	for eacl	h month			(83)m :	= Sum(74)m .	(82)m			-	
(83)m= 130.87		349.43	482.64	586.24	602.16		491.7	395.04	266.41	158.75	110.71		(83)
Total gains –	-		` ,	` ´ 	`	<u> </u>	1	_				1	
(84)m= 575.94	676.8	777.87	887.69	967.41	960.39	915.54	841.3	756.69	651.67	571.16	543.6		(84)
7. Mean inte	rnal temp	perature ((heating	season)								
Temperature	e during h	neating p	eriods ir	n the livi	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
								` ,					
Utilisation fa	ctor for g	ains for I	iving are	ea, h1,m	(see T	able 9a)	·	,					
Utilisation fa	ctor for g Feb	ains for I Mar	iving are Apr	ea, h1,m May	(see T Jun	able 9a) Jul	Au	<u> </u>	Oct	Nov	Dec		
					<u> </u>	1 	I .	g Sep	Oct 0.94	Nov 0.98	Dec 0.99		(86)
(86)m= 0.99	Feb 0.98	Mar 0.96	Apr 0.91	May 0.8	Jun 0.65	Jul 0.5	Au 0.56	g Sep 0.78		+			(86)
Jan	Feb 0.98	Mar 0.96	Apr 0.91	May 0.8	Jun 0.65	Jul 0.5	Au 0.56	g Sep 0.78		+			(86)
(86)m= 0.99 Mean internation (87)m= 21	Feb 0.98 al temper	Mar 0.96 rature in l	Apr 0.91 living are	0.8 ea T1 (fo	Jun 0.65 ollow ste	Jul 0.5 eps 3 to 7	Au 0.56 7 in Ta 21	g Sep 0.78 able 9c) 21	0.94	0.98	0.99		
Jan (86)m= 0.99 Mean interna	Feb 0.98 al temper	Mar 0.96 rature in l	Apr 0.91 living are	0.8 ea T1 (fo	Jun 0.65 ollow ste	Jul 0.5 eps 3 to 7	Au 0.56 7 in Ta 21	g Sep 0.78 able 9c) 21 Th2 (°C)	0.94	0.98	0.99		
(86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86	Feb 0.98 al temper 21 e during h 19.86	Mar 0.96 rature in l 21 neating p 19.86	Apr 0.91 living are 21 eriods ir 19.88	May 0.8 ea T1 (for 21 n rest of 19.88	Jun 0.65 ollow ste 21 dwellin 19.89	Jul 0.5 eps 3 to 7 21 g from Ta 19.89	Au 0.56 7 in Ta 21 able 9,	g Sep 0.78 able 9c) 21 Th2 (°C)	0.94	0.98	0.99		(87)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa	Feb 0.98 al temper 21 e during h 19.86 ctor for g	Mar 0.96 ature in 1 21 neating p 19.86 ains for r	Apr 0.91 living are 21 eriods ir 19.88	May 0.8 ea T1 (for 21 rest of 19.88 welling,	Jun 0.65 ollow st 21 dwellin 19.89 h2,m (s	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 see Table	Au 0.56 7 in Ta 21 able 9, 19.9	g Sep 0.78 able 9c) 21 . Th2 (°C) 19.89	0.94 21 19.88	0.98 21 19.88	0.99		(87)
Jan 0.99	Feb 0.98 al temper 21 e during r 19.86 ctor for g 0.97	Mar 0.96 rature in 1 21 neating p 19.86 ains for r 0.95	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39	Au 0.567 in Ta 21 21 21 29 29 29 20 0.44	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89	0.94 21 19.88	0.98	0.99		(87)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper	Mar 0.96 eature in leating p 19.86 ains for r 0.95 eature in t	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelli	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 f	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table	0.94 21 19.88 0.92 e 9c)	0.98 21 19.88 0.97	0.99 21 19.87 0.99		(87) (88) (89)
Jan 0.99	Feb 0.98 al temper 21 e during r 19.86 ctor for g 0.97	Mar 0.96 rature in 1 21 neating p 19.86 ains for r 0.95	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39	Au 0.567 in Ta 21 21 21 29 29 29 20 0.44	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99		(87) (88) (89) (90)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper	Mar 0.96 eature in leating p 19.86 ains for r 0.95 eature in t	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelli	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 f	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99	0.27	(87) (88) (89)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86	Mar 0.96 ature in 1 21 neating p 19.86 ains for r 0.95 ature in 1 19.86	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88	May 0.8 ea T1 (for the second	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99	0.27	(87) (88) (89) (90)
Jan 0.99	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86	Mar 0.96 ature in 1 21 neating p 19.86 ains for r 0.95 ature in 1 19.86	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88	May 0.8 ea T1 (for the second	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction for the first separate of the first se	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99	0.27	(87) (88) (89) (90)
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Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17	Mar 0.96 ature in 1 19.86 ains for r 0.95 ature in 1 19.86 ature (fo 20.17 he mean 20.17	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88 r the wh 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 ole dwe 20.19	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1 19.9 + (1 - 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates a pro-	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi	0.98 21 19.88 0.97 19.88 ng area ÷ (4	0.99 21 19.87 0.99 19.87	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating required	Mar 0.96 ature in l 19.86 ains for r 0.95 ature in t 19.86 ature (fo 20.17 he mean 20.17 uirement	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling, 19.88 cole dwe 20.19 temper 20.19	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 4 4 e, w 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates a proximate approximate approx	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18	0.99 21 19.87 0.99 19.87 1) =		(87) (88) (89) (90) (91) (92)
Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating required	Mar 0.96 ature in 1 19.86 ains for r 0.95 ature in 1 19.86 ature (fo 20.17 he mean 20.17 uirement ternal ternal ternal ternal	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 4 4 e, w 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates a proximate approximate approx	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18	0.99 21 19.87 0.99 19.87 1) =		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.99 Mean internative (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internative (90)m= 19.86 Mean internative (92)m= 20.17 Apply adjust (93)m= 20.17 8. Space he Set Ti to the the utilisation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating required factor for g	Mar 0.96 ature in langer of the mean ature (for 20.17) ature in the mean ature or gains to regains to respect to the mean ature at the mean ature or gains to regains to regains to respect to the mean ature at the mean a	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18 mperaturusing Ta	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain able 9a	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2 tep 11 of	Au 0.56 7 in Ta able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 Table	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approxes 20.19	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18 20.18	0.99 21 19.87 0.99 19.87 20.18 20.18		(87) (88) (89) (90) (91) (92)
Mean internations (86)m= 0.99 Mean internations (87)m= 21 Temperature (88)m= 19.86 Utilisation far (89)m= 0.99 Mean internations (90)m= 19.86 Mean internations (92)m= 20.17 Apply adjust (93)m= 20.17 8. Space he Set Ti to the the utilisation Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating requires require factor for g	Mar 0.96 ature in l 19.86 ains for r 0.95 ature in t 19.86 ature (fo 20.17 he mean 20.17 uirement ternal ter or gains to Mar	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18 mperaturusing Ta	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 4 4 e, w 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 f -fLA) × T2 20.19 where approx 2 20.19	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18	0.99 21 19.87 0.99 19.87 1) =		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.99 Mean internative (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internative (90)m= 19.86 Mean internative (92)m= 20.17 Apply adjust (93)m= 20.17 8. Space he Set Ti to the the utilisation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating requires require factor for g	Mar 0.96 ature in l 19.86 ains for r 0.95 ature in t 19.86 ature (fo 20.17 he mean 20.17 uirement ternal ter or gains to Mar	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18 mperaturusing Ta	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain able 9a	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2 tep 11 of	Au 0.56 7 in Ta able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 Table	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates 20.19 g Sep Sep	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18 20.18	0.99 21 19.87 0.99 19.87 20.18 20.18		(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m	(O=)
(95)m= 567.93 660.01 739.63 789.82 744.33 564.99 386.41 400.99 554.25 600.53 557.48 537.35	(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]	(00)
(97)m= 1825.6 1751.59 1563.73 1272.59 954.52 621.62 399.42 420.86 680.03 1078.25 1479.32 1816.79	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	, ,
(98)m= 935.71 733.54 613.13 347.59 156.38 0 0 0 0 355.43 663.73 951.9	
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =	4757.41 (98)
Space heating requirement in kWh/m²/year	52.81 (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	257.28 (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)	KVVIII yCai
935.71 733.54 613.13 347.59 156.38 0 0 0 0 355.43 663.73 951.9	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
363.7 285.12 238.31 135.11 60.78 0 0 0 138.15 257.98 369.99	(= : : /
Total (kWh/year) =Sum(211) _{15,1012} =	1849.15 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)] } x 100 ÷ (208)	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) =Sum(215) _{15,10,12} =	0 (215)
Water heating	
Output from water heater (calculated above)	
91.66 78.14 87.28 77.81 96.56 145.78 140 153.68 153.41 82.23 83.91 88.31	
Efficiency of water heater	188.96 (216)
(217)m= 188.96 188.	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	
(219)m= 48.51 41.35 46.19 41.18 51.1 77.15 74.09 81.33 81.19 43.52 44.41 46.74	
Total = Sum(219a) ₁₁₂ =	676.76 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	1849.15
Water heating fuel used	676.76
Electricity for pumps, fans and electric keep-hot	
Total electricity for the above, kWh/year sum of (230a)(230g) =	0 (231)

Electricity for lighting (232)380.53 (233) Electricity generated by PVs -1086.82 Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 1819.62 (338)12a. CO2 emissions – Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) 0.519 959.71 (261)Space heating (secondary) (215) x (263)0.519 0 Water heating (219) x (264)0.519 351.24 (261) + (262) + (263) + (264) =Space and water heating 1310.95 (265)(231) x Electricity for pumps, fans and electric keep-hot (267)0.519 0 (232) x Electricity for lighting 0.519 197.49 (268)Energy saving/generation technologies Item 1 (269)0.519 -564.06 sum of (265)...(271) = Total CO2, kg/year 944.38 (272) $(272) \div (4) =$ **Dwelling CO2 Emission Rate** 10.48 (273)

El rating (section 14)

(274)

91

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:57:16

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Mid-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -GREEN

Plot Reference: Sample 2

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)

25.42 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.13 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.8 kWh/m²

OK 2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) **OK** Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 8.5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.47 kWh/day

Permitted by DBSCG: 2.24 kWh/day OK

Primary pipework insulated:	Yes		ок
6 Controls			
Space heating controls	TTZC by plumbing and e	lectrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames vall	ey):	Medium	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: North West		7.55m²	
Windows facing: South East		8.19m²	
Windows facing: South West		0.55m²	
Roof windows facing: North W	est	1.01m²	
Ventilation rate:		4.00	
10 Key features			
Roofs U-value		0.12 W/m²K	
Party Walls U-value		0 W/m²K	

Photovoltaic array

			User D	etails:						
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12		Softwa	are Vei	sion:		Versio	n: 1.0.5.41	
		Р	roperty .	Address	Sample	2				
Address:										
Overall dwelling dime	nsions:		Aros	a(m²)		Av. Hei	iaht(m)		Volume(m³)	\
Ground floor				3.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			3	3.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor			2	23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 9	0.08	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	7 + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	<u> </u>	0] = [0	x	20 =	0	(6b)
Number of intermittent far	ns					3	x -	10 =	30	(7a)
Number of passive vents						0	x :	10 =	0	(7b)
Number of flueless gas fir	res					0	X 4	40 =	0	(7c)
								Δir ch	anges per ho	ur
Infiltration due to chimney	vs. flues and fans = (6a)+(6b)+(7	'a)+(7b)+(7c) =	Г	30		÷ (5) =	0.13	(8)
If a pressurisation test has be					continue fr			(-)	0.10	
Number of storeys in the	ne dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.					•	uction			0	(11)
if both types of wall are producting areas of openin		sponding to	the great	er wall are	a (after					
If suspended wooden fl		ıled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	ur per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then (18) = [(17) ÷ 20]+(3), otherwi	se (18) = (16)				0.38	(18)
Air permeability value applies	s if a pressurisation test ha	s been dor	e or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltere	d			(00)	ro 075 /4	0)1			0	(19)
Shelter factor				(20) = 1 -	`	9)] =			1	(20)
Infiltration rate incorporati	_	.1		(21) = (18) x (20) =				0.38	(21)
Infiltration rate modified for				l .]	
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		1						T	Ī	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Factor (22a\m =	(22)m ÷	4									
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	
	<u>'</u>											I
Adjusted infilt	ration rat	e (allow 0.47	ing for st	nelter an	d wind s	peed) 0.37	= (21a) x 0.36	(22a)m 0.38	0.41	0.43	0.45	1
Calculate effe				-			0.30	0.36	0.41	0.43	0.45	
If mechanic	al ventila	ition:										0 (23
If exhaust air h	neat pump	using App	endix N, (2	23b) = (23a	a) × Fmv (e	equation	(N5)) , othe	rwise (23b	o) = (23a)			0 (23
If balanced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fro	om Table 4h) =				0 (23
a) If balance	1	1	1		1	- 	VHR) (24a	í `	2b)m + (23b) × [1 – (23c)	1
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24
b) If balance			1				````	ŕ	<u> </u>			1
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(24
c) If whole h				•	•		tion from (4c) = (22t		5 x (23h	.)		
(24c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0	(24
d) If natural												`
							= 0.5 + [(2		0.5]			
(24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (2	24d) in box	x (25)				
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	(25
3. Heat losse	es and he	eat loss	paramete	er:								
3. Heat losse	es and he Gros area	ss	paramet Openin m	ıgs	Net Ar A ,r		U-val W/m2		A X U (W/I	<)	k-value kJ/m²·ł	
	Gros	ss	Openin	ıgs		n²	W/m2			<) 		
ELEMENT	Gros area	ss	Openin	ıgs	A ,r	m²	W/m2	2K =	(W/I	<) 		K kJ/K
ELEMENT Doors	Gros area e 1	ss	Openin	ıgs	A ,r	m² ×	W/m2	eK = 0.04] =	(W/l	<) 		K kJ/K (26
ELEMENT Doors Windows Typ	Gros area e 1 e 2	ss	Openin	ıgs	A ,r 2.28 7.55	m² ×	W/m2 1.2 (1/[1/(1.2)+	= 0.04] = 0.04] =	(W/l 2.736 8.65	<) 		K kJ/K (26 (27
ELEMENT Doors Windows Typ Windows Typ	Gros area e 1 e 2	ss	Openin	ıgs	A ,r 2.28 7.55 8.19	m² ×	W/m2 1.2 1/[1/(1.2)+ 1/[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38	<) 		K kJ/K (26 (27 (27
Doors Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2	ss	Openin	ıgs	A ,r 2.28 7.55 8.19 0.55	m² ×	W/m2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38 0.63			K kJ/K (26 (27 (27 (27
Doors Windows Typ Windows Typ Windows Typ Rooflights	Gros area e 1 e 2	ss (m²)	Openin	igs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (0.14	0.04] = 0.04] = 0.04] = 0.04] =	(W/l 2.736 8.65 9.38 0.63 1.212		kJ/m²·l	K kJ/K (26 (27 (27 (27
Doors Windows Type Windows Type Windows Type Rooflights Floor	Gros area e 1 e 2 e 3	ss (m²)	Openin n	igs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1.2)+ (1.2)+ (1.2)+ (1.2)+ (1.2)+ (1.2)+ (1.2)+ (1.2)+	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676		kJ/m²·l	K kJ/K (26 (27 (27 (27 (27 (28 (28 (28 (28 (28 (28 (28 (28 (28 (28
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93		110 60	K kJ/K (26 (27 (27 (27 (27 (28 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62	m²	W/m2 (1,2) (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (0.14) (0.18) (0.18)	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93		110 60 9	K kJ/K (26 (27 (27 (27 (27 (28 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1	Gros area e 1 e 2 e 3 90.3 6.66 25.5	88 2 2 2	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (0.14 (0.18 (0.18 (0.12 (0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95		110 60 9	K kJ/K (26 (27 (27 (27 (27 (27 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (1/[1/(1.2)+ (0.14 (0.18 (0.18 (0.12 (0.1	2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95		110 60 9 9	K kJ/K (26 (27 (27 (27 (27 (27 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29
Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95		110 60 9 9	K kJ/K (26 (27 (27 (27 (27 (27 (28 (28 (29 (29 (29 (30 (29 (30 (33.48 (30 (30 (30 (30 (30 (30 (30 (30 (30 (30
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of 6	Gros area e 1 e 2 e 3 90.3 6.6: 25.5 6.2: 3.7: elements	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62		110 60 9 9	K kJ/K (26 (27 (27 (27 (27 (27 (28 (29 (29 (29 (29 (30 (31 (31 (31 (31 (31 (31 (31 (31 (31 (32 (31 (32 (31 (32 (32 (32 (32 (32 (33 (33 (33 (33 (33
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of elements	Gros area e 1 e 2 e 3 90.3 6.6: 25.5 6.2: 3.7: elements	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62		110 60 9 9 9	K kJ/K (26 (27 (27 (27 (27 (27 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29
ELEMENT Doors Windows Typ Windows Typ Windows Typ Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of 6 Party wall Internal wall *	Gros area e 1 e 2 e 3 90.3 6.66 25.5 6.22 3.72 elements	88 2 99 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8 77.56	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[2K = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62		110 60 9 9 9 9	K kJ/K (26 (27 (27 (27 (27 (27 (27 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29
ELEMENT Doors Windows Type Windows Type Windows Type Rooflights Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Roof Type3 Total area of elements Party wall Internal wall * Internal floor	Gros area e 1 e 2 e 3 90.3 6.6 25.5 6.22 3.72 elements	88 2 2 2 2 , m ²	Openin m 18.5 0 1.01 0 overline the street of the str	ngs 7	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 71.81 6.62 24.58 6.22 3.72 165.8 77.56 95.5 56.74 alue calculations	m²	W/m2 (1.2 (1/[1/(1.2)+ (1/[1/(1.	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/I 2.736 8.65 9.38 0.63 1.212 4.6676 12.93 1.19 2.95 0.62 0.34		110 60 9 9 9 9 18 9	K kJ/K (26 (27 (27 (27 (27 (27 (27 (27 (28 (29 (29 (29 (29 (29 (29 (29 (29 (29 (29

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

45.24

(33)

Heat ca	apacity (Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	14227.94	(34)
		,	ter (TMF	P = Cm ÷	- TFA) ir	ı kJ/m²K			= (34)	÷ (4) =			157.95	(35)
For desig	gn assess	ments wh	ere the de tailed calcu	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	107.00	
			x Y) cal		ısina Δn	nandiy l	<i>(</i>						40.00	(36)
	_	,	are not kn			•	``						16.86	(36)
Total fa			are not kir	OWII (30) -	- 0.00 X (3	1)			(33) +	(36) =			62.1	(37)
Ventilat	tion hea	nt loss ca	alculated	l monthly	V				(38)m	= 0.33 × (25)m x (5)		V=	` ′
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	45.62	45.28	44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat tra	ansfer c	oefficier	nt, W/K				ļ.		(39)m	= (37) + (3	38)m		l	
(39)m=	107.72	107.38	107.04	105.46	105.17	103.79	103.79	103.53	104.32	105.17	105.77	106.39		
Heat lo	ss para	meter (F	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	105.46	(39)
(40)m=	1.2	1.19	1.19	1.17	1.17	1.15	1.15	1.15	1.16	1.17	1.17	1.18		
` ′ L								<u> </u>	,	Average =	Sum(40) _{1.}	12 /12=	1.17	(40)
Numbe	r of day	s in mor	nth (Tab	le 1a)						ŭ	` '			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
							-							
4. Wat	ter heat	ing ener	rgy requi	irement:								kWh/y	ear:	
												j		
A ccum/														
		ipancy, l		[1 _{- eyn}	(<u>-</u> 0 0003	840 v (TF	-Δ ₋ 13 Ω)2)] + 0 ()013 v (Γ Γ Δ _13		63		(42)
if TF		9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (ΓFA -13.		63		(42)
if TFA if TFA Annual	A > 13.9 A £ 13.9 averag	9, N = 1 9, N = 1 e hot wa	+ 1.76 x ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		9) 96	.59		(42)
if TFA if TFA Annual Reduce to	A > 13.9 A £ 13.9 averag the annua	9, N = 1 9, N = 1 e hot wa d average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed t	(25 x N)	+ 36		9) 96			` ,
if TFA if TFA Annual Reduce to	A > 13.9 A £ 13.9 averag the annua that 125	O, N = 1 O, N = 1 e hot want average litres per p	+ 1.76 x ater usac hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, f	ay Vd,av	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	e target o	9) 96	.59		` ,
if TFA if TFA Annual Reduce to not more	A > 13.9 A £ 13.9 averag the annua that 125 Jan	P, N = 1 P, N = 1 P hot was A average Itres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, I	ay Vd,avelling is the foot and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9) 96			` ,
if TFA if TFA Annual Reduce to not more Hot water	A > 13.9 A £ 13.9 averag the annua that 125 Jan r usage in	P, N = 1 P, N = 1 Po hot was all average litres per p Peb n litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d rater use, I May Vd,m = fa	ay Vd,avelling is a not and con Jun ctor from T	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target of	9) 96 Nov	.59		` ,
if TFA if TFA Annual Reduce to not more	A > 13.9 A £ 13.9 averag the annua that 125 Jan	P, N = 1 P, N = 1 P hot was A average Itres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, I	ay Vd,avelling is the foot and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep	Oct 98.52	9) 96 Nov	Dec 106.25	1159 04	(43)
if TFA if TFA Annual Reduce to not more Hot water (44)m=	A > 13.9 A £ 13.9 averag the annua that 125 Jan r usage ir	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d rater use, I May Vd,m = fa 90.79	ay Vd,av welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Fotal = Sur	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	` ,
if TFA if TFA Annual Reduce to not more Hot water (44)m=	A > 13.9 A £ 13.9 averag the annua that 125 Jan r usage ir	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month 94.66	es per da 5% if the d rater use, I May Vd,m = fa 90.79	ay Vd,av welling is not and con Jun ctor from 1	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Fotal = Sur	9) 96 Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co	A > 13.9 A £ 13.9 averag the annua that 125 Jan r usage ir 106.25 ontent of	P, N = 1 P, N = 1 P, N = 1 P hot was A average A litres per p Peb P litres per 102.38 A hot water	+ 1.76 x ater usag hot water person per Mar day for ea 98.52 used - calc	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d vater use, I May Vd,m = fa 90.79	ay Vd,avilwelling is not and conductor from 186.93	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 90.79	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = ables 1b, 1	.59 Dec 106.25 c, 1d) 152.59	1159.04	(43)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m=	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage in 106.25 ontent of	P, N = 1 P, N = 1 P, N = 1 P hot was If average Iltres per p Peb In litres per 102.38 Phot water 137.8	+ 1.76 x ater usag hot water person per Mar day for ea 98.52 used - calc	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co. Jun ctor from T 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) to achieve Aug (43) 90.79 90.79 109.15	+ 36 a water us Sep 94.66 6 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m=	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage in 106.25 ontent of 157.56 aneous w 23.63	P, N = 1 P, N = 1 P, N = 1 P + N = 1	+ 1.76 x ater usag hot water person per Mar day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66 culated mo	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co. Jun ctor from T 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) to achieve Aug (43) 90.79 90.79 109.15	+ 36 a water us Sep 94.66 6 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m= Water S	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage in 106.25 ontent of 157.56 aneous w 23.63 Storage	P, N = 1 P, N = 1 P, N = 1 P hot was all average litres per p Peb Politres per Politres per Peb Politres per Politres per Peb Politres per Politres per Peb Politres per Peb Politres per Politr	ter usage hot water person per Mar day for ear 98.52 used - calculate 142.2 ang at point 21.33	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the da ster use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84	ay Vd,av Iwelling is not and con Jun ctor from 1 86.93 190 x Vd,r 102.65	erage = designed to designed t	(25 x N) to achieve Aug (43) 90.79 07m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ =	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45) (46)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m= Water s Storage	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage in 106.25 ontent of 157.56 aneous w 23.63 Storage e volum	P, N = 1 P, N = 1 P, N = 1 P + N = 1	+ 1.76 x ater usag hot water person per Mar day for ea 98.52 used - calc 142.2 ng at point 21.33	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the of sater use, I May Vd,m = far 90.79 onthly = 4. 118.95 o hot water 17.84 olar or W	ay Vd,ave livelling is that and construction from Tour 190 x Vd,ro 102.65 ar storage),	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) 96 Nov 102.38 m(44) ₁₁₂ = ables 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m= Water s Storage If comm	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage in 106.25 ontent of 157.56 aneous w 23.63 Storage e volum nunity h	P, N = 1 P, N = 1 P, N = 1 P + N = 1	the table of the table of the table of the table of table	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (not) 18.6 ag any so	es per da 5% if the d sater use, f May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 plar or W yelling, e	ay Vd,avi welling is not and col Jun ctor from 1 86.93 190 x Vd,ri 102.65 r storage), 15.4 /WHRS	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
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if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m= Water s Storage If comm Otherw Water s a) If ma	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage ir 106.25 ontent of 157.56 aneous w 23.63 storage e volum nunity h ise if no storage anufact	P, N = 1 P,	+ 1.76 x ater usage hot water person per Mar 98.52 used - calce 142.2 ang at point 21.33 a including and no talce hot water eclared left.	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (not) 18.6 ing any so ink in dw er (this in	es per da 5% if the d sater use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,ave livelling is that and constant and constant are livelled by the live	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89 200		(43) (44) (45) (46) (47)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m= Water s Storage If comm Otherw Water s a) If ma Temper	A > 13.9 A £ 13.9 average the annual that 125 Jan rusage in 106.25 ontent of 157.56 aneous w 23.63 storage evoluming he is if no storage anufaction and the trature factors are trature factors and the trature factors and the trature factors are trature factors are trature factors are trature factors and trature factors are trature factors are trature factors and trature factors are trature factors are trature factors are trature factors are trature factors and trature factors are trature fa	P, N = 1 P,	the transport of transport of the transport of the transport of the transport of transport of the transport of the transport of the transport of transport of the transport of trans	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (not 18.6 and any so ank in dw er (this in oss facto 2b	es per da 5% if the d sater use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e acludes i	ay Vd,ave livelling is that and constant and constant are livelled by the live	erage = designed to do	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47) pmbi boil	+ 36 a water us Sep 94.66 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08 47)	.59 Dec 106.25 c, 1d) 152.59 22.89 200		(43) (44) (45) (46) (47) (48) (49)
if TFA if TFA Annual Reduce to not more Hot water (44)m= Energy co (45)m= If instanta (46)m= Water s Storage If comm Otherw Water s a) If ma Temper Energy	A > 13.9 A £ 13.9 averag the annual that 125 Jan r usage ir 106.25 ontent of 157.56 aneous w 23.63 storage e volum nunity h ise if no storage anufact rature fa lost fro	P, N = 1 P,	+ 1.76 x ater usage hot water person per Mar 98.52 used - calce 142.2 ang at point 21.33 a including and no talce hot water eclared left.	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (not) 18.6 ing any so ink in dw er (this in oss facto 2b	es per da 5% if the d ater use, I May Vd,m = fa 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e acludes i or is knowear	ay Vd,ave lwelling is not and con Jun 86.93 190 x Vd,n 102.65 r storage), 15.4 /WHRS enter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous con/day):	(25 x N) to achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 110.45 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) 96 Nov 102.38 m(44) ₁₁₂ = sbles 1b, 1 140.51 m(45) ₁₁₂ = 21.08 47)	.59 Dec 106.25 c, 1d) 152.59 22.89 200		(43) (44) (45) (46) (47)

	ter storage				e 2 (kW	h/litre/da	ıy)					0		(51)
	nunity hea	-		on 4.3									•	
	e factor fro rature fact			2h							-	0		(52)
•								(47) v (E4)	. v. (EQ) v. ('E2\ -		0		(53)
	lost from (50) or (54		_	, KVVN/ye	ear			(47) x (51)) X (52) X ((53) =	-	0 79		(54) (55)
,	storage los	, ,	•	or each	month			((56)m = (55) × <i>(4</i> 1)	m	0.	79		(55)
					1	22.21							1	(50)
(56)m=	24.61 2 r contains de	22.23	24.61	23.81	24.61 m = (56)m	23.81	24.61	24.61	23.81	24.61	23.81	24.61	iv H	(56)
		-			1									(57)
(57)m=	24.61 2	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
-	circuit los	•	•									0		(58)
-	circuit los					,	. ,	, ,		v 4la a vaa a				
` _	23.26 2							23.26	22.51	23.26	22.51	22.26		(59)
(59)m=		21.01	23.26	22.51	23.26	22.51	23.26		22.51	23.20	22.51	23.26		(39)
	loss calcu	lated f	for each	month ((61)m =	(60) ÷ 36	65 × (41))m		,	1		•	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat require	ed for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.43	81.04	190.07	170.3	166.83	148.98	142.99	157.02	156.78	176.59	186.84	200.46		(62)
Solar DH	W input calc	culated ι	using App	endix G or	Appendix	H (negativ	ve quantity	v) (enter '0	' if no sola	ır contribut	ion to wate	er heating)		
(add ad	lditional lir	nes if F	GHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	112.29 1	101.9	101.78	91.92	58.72	3.19	2.99	3.34	3.37	93.8	101.98	110.73		(63) (G2)
Output	from wata	r hoat	or											
Cutput	from wate	i iicai	.01							_			_	
(64)m=		79.14	88.29	78.38	108.1	145.78	140	153.68	153.41	82.79	84.86	89.73		_
· -		-		78.38	108.1	145.78	140			82.79 ater heate		L	1297.29	(64)
(64)m=		79.14	88.29	kWh/m	onth 0.2	5 ′ [0.85		Outp	out from w	ater heate	I r (annual)₁	12		(64)
(64)m= [93.14 7	79.14	88.29	kWh/m	onth 0.2			Outp	out from w	ater heate	I r (annual)₁	12		(64) (65)
(64)m= [Heat ga (65)m= [93.14 7	79.14 water I	88.29 heating, 85.58	kWh/mo	onth 0.29	5 ´ [0.85 71.19	× (45)m	Outp + (61)m 74.59	out from w n] + 0.8 x 73.79	ater heate x [(46)m 81.1	+ (57)m 83.78	+ (59)m 89.03]	_
(64)m= [Heat ga (65)m= [include	93.14 7 ains from v 90.68 8	water I 30.41 in calc	88.29 heating, 85.58 ulation o	kWh/mo 78.28 of (65)m	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outp + (61)m 74.59	out from w n] + 0.8 x 73.79	ater heate x [(46)m 81.1	+ (57)m 83.78	+ (59)m 89.03]	_
Heat ga (65)m= include 5. Inte	93.14 7 ains from v 90.68 8 de (57)m i ernal gains	water I 30.41 in calc s (see	88.29 heating, 85.58 ulation of	kWh/mo 78.28 of (65)m and 5a	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outp + (61)m 74.59	out from w n] + 0.8 x 73.79	ater heate x [(46)m 81.1	+ (57)m 83.78	+ (59)m 89.03]	_
Heat ga (65)m= include 5. Inte	93.14 7 ains from v 90.68 8 de (57)m i ernal gains	water I 30.41 in calc s (see	88.29 heating, 85.58 ulation of	kWh/mo 78.28 of (65)m and 5a	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outp + (61)m 74.59	out from w n] + 0.8 x 73.79	ater heate x [(46)m 81.1	+ (57)m 83.78	+ (59)m 89.03]	_
Heat ga (65)m= include 5. Inte	93.14 7 ains from v 90.68 8 de (57)m i ernal gains blic gains (Jan	water I 30.41 in calc s (see	heating, 85.58 ulation of Table 5	kWh/mo 78.28 of (65)m 6 and 5a	onth 0.29 77.85 only if c	5 ´ [0.85 71.19 ylinder is	× (45)m 69.92 s in the o	Outp + (61)m 74.59 dwelling	73.79 or hot w	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	_
Heat ga (65)m= includ 5. Inte Metabo (66)m=	93.14 7 ains from v 90.68 8 de (57)m i ernal gains blic gains (Jan	water I 30.41 in calc s (see Table Feb	88.29 heating, 85.58 ulation of the control of the	kWh/mo 78.28 of (65)m and 5a ts Apr 131.34	onth 0.29 77.85 only if c): May	5 ´ [0.85 71.19 ylinder is Jun 131.34	× (45)m 69.92 s in the o	Outp + (61)m 74.59 dwelling Aug 131.34	out from w 73.79 or hot w Sep 131.34	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	(65)
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Heat ga (65)m= includ 5. Inte Metabo (66)m= Lighting (67)m= Applian (68)m= Cooking	93.14 7 ains from v 90.68 8 de (57)m i ernal gains lic gains (Jan 131.34 13 g gains (ca 21.55 1 aces gains 239.22 24 g gains (ca	water I 30.41 in calc s (see Table Feb 31.34 alculat 19.14 s (calculat 41.71 alculat	heating, 85.58 ulation of Table 5 5), Wat Mar 131.34 ed in Ap 15.56 ulated in 235.45 ted in Ap	kWh/mo 78.28 of (65)m and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13	onth 0.29 77.85 only if c): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a)	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 See Table 182.74	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
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Heat ga (65)m= [include 5. Inter Metabo (66)m= [Lighting (67)m= [Applian (68)m= [Cooking (69)m= [Pumps	93.14 7 ains from v 90.68 8 de (57)m i ernal gains blic gains (Jan 131.34 13 g gains (ca 21.55 1 aces gains 239.22 2 g gains (ca 36.13 3 and fans	water I 30.41 in calc s (see Table Feb 31.34 alculat 9.14 (calculat 41.71 alculat 36.13 gains	88.29 heating, 85.58 ulation of the test o	kWh/mo 78.28 of (65)m and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a) 36.13	Outp + (61)m 74.59 dwelling Malso see 10.44 3a), also 176.49 0, also se 36.13	Sep 131.34 Table 5 14.02 See Ta 182.74 ee Table 36.13	A column	(annual), + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat ga (65)m= [include 5. Inter Metabo (66)m= [Lighting (67)m= [Applian (68)m= [Cooking (69)m= [Pumps (70)m= [93.14 7 ains from v 90.68 8 de (57)m i ernal gains lic gains (Jan 131.34 13 g gains (ca 21.55 1 aces gains 239.22 24 g gains (ca 36.13 3 and fans 0	water I 30.41 in calc s (see Table Feb 31.34 alculat 9.14 c (calculat 41.71 alculat 36.13 gains 0	heating, 85.58 ulation of Table 5 5), Wat Mar 131.34 ed in Ap 15.56 ulated in 235.45 ted in Ap 36.13 (Table 5	kWh/mo 78.28 of (65)m 6 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a)	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 See Table 182.74	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat ga (65)m= [include 5. Intention Metabo (66)m= [Lighting (67)m= [Applian (68)m= [Cooking (69)m= [Pumps (70)m= [Losses	93.14 7 ains from v 90.68 8 de (57)m i ernal gains blic gains (Jan 131.34 1: g gains (ca 21.55 1 aces gains 239.22 2- g gains (ca 36.13 3 and fans 0 e.g. evap	water I 30.41 in calc s (see Table Feb 31.34 alculat 19.14 s (calculat 41.71 alculat 36.13 gains 0	heating, 85.58 ulation of Table 5 5), Wat Mar 131.34 ed in Ap 15.56 ulated in 235.45 ted in Ap 36.13 (Table 5	kWh/mo 78.28 of (65)m and 5a ts Apr 131.34 opendix 11.78 Append 222.13 opendix 36.13 5a) 0	onth 0.29 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 fon L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a) 36.13	Outp + (61)m 74.59 dwelling 131.34 lso see 10.44 3a), also 176.49 o, also se 36.13	Sep 131.34 Table 5 14.02 see Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat ga (65)m= [includ 5. Inte Metabo (66)m= [Lighting (67)m= [Applian (68)m= [Cooking (69)m= [Pumps (70)m= [Losses (71)m= [93.14 7 ains from v 90.68 8 de (57)m i ernal gains lic gains (ca 21.55 1 aces gains 239.22 2 g gains (ca 36.13 3 and fans 0 e.g. evap -105.07 -1	water I 30.41 in calc s (see Table Feb 31.34 alculat 19.14 s (calculat 41.71 alculat 36.13 gains 0 oration 05.07	88.29 heating, 85.58 ulation of the test o	kWh/mo 78.28 of (65)m 6 and 5a ts Apr 131.34 opendix 11.78 Appendix 222.13 opendix 36.13	onth 0.29 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a) 36.13	Outp + (61)m 74.59 dwelling Malso see 10.44 3a), also 176.49 0, also se 36.13	Sep 131.34 Table 5 14.02 See Ta 182.74 ee Table 36.13	A column	(annual), + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat ga (65)m= [includ 5. Inte Metabo (66)m= [Lighting (67)m= [Applian (68)m= [Cooking (69)m= [Pumps (70)m= [Losses (71)m= [93.14 7 ains from v 90.68 8 de (57)m i ernal gains dic gains (ca 21.55 1 dees gains 239.22 2 g gains (ca 36.13 3 and fans 0 e.g. evap -105.07 -1 deating gains	water I 30.41 in calc s (see Table Feb 31.34 alculat 19.14 s (calculat 41.71 alculat 36.13 gains 0 oration 05.07	88.29 heating, 85.58 ulation of the test o	kWh/mo 78.28 of (65)m and 5a ts Apr 131.34 opendix 11.78 Append 222.13 opendix 36.13 5a) 0	onth 0.29 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 fon L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a) 36.13	Outp + (61)m 74.59 dwelling 131.34 lso see 10.44 3a), also 176.49 o, also se 36.13	Sep 131.34 Table 5 14.02 see Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal	gains =	ı			(66	s)m + (67)m	ı + (68	8)m +	· (69)m + (70)m +	(71)m + (72)	m		
(73)m= 445.06	442.9	428.44	405.04	381.17	358.24	343.39	349.	.59	361.64	385.26	412.41	432.88		(73)
6. Solar gains	:													
Solar gains are ca	alculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions t	to co	nvert to the	e applica	able orientat	ion.		
Orientation: A			Area		Flu			_	g_ = b.l.= Cb		FF		Gains	
_	able 6d		m²			ble 6a			able 6b		Table 6c		(W)	
Southeast _{0.9x}	0.77	X	8.	19	x	36.79	X		0.63	X	0.7	=	92.09	(77)
Southeast _{0.9x}	0.77	X	8.	19	x	62.67	X		0.63	x	0.7	=	156.87	(77)
Southeast 0.9x	0.77	X	8.	19	x	85.75	X		0.63	×	0.7	=	214.64	(77)
Southeast 0.9x	0.77	X	8.1	19	X	106.25	X		0.63	_ x	0.7	=	265.94	(77)
Southeast 0.9x	0.77	X	8.	19	X _	119.01	X		0.63	x	0.7	=	297.88	(77)
Southeast 0.9x	0.77	X	8.1	19	X	118.15	X		0.63	×	0.7	=	295.73	(77)
Southeast 0.9x	0.77	X	8.1	19	X	113.91	X		0.63	_ x	0.7	=	285.11	(77)
Southeast 0.9x	0.77	X	8.1	19	X	104.39	X		0.63	×	0.7	=	261.29	(77)
Southeast 0.9x	0.77	X	8.1	19	X	92.85	X		0.63	X	0.7	=	232.41	(77)
Southeast 0.9x	0.77	X	8.1	19	x	69.27	X		0.63	x	0.7	=	173.37	(77)
Southeast 0.9x	0.77	X	8.	19	X	44.07	X		0.63	x	0.7	=	110.31	(77)
Southeast 0.9x	0.77	X	8.	19	x	31.49	X		0.63	x	0.7	=	78.81	(77)
Southwest _{0.9x}	0.77	X	3.0	55	x	36.79			0.63	x	0.7	=	6.18	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	62.67			0.63	x	0.7	=	10.53	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	85.75			0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X _	106.25			0.63	X	0.7	=	17.86	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	119.01			0.63	x	0.7	=	20	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	118.15			0.63	x	0.7	=	19.86	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	113.91			0.63	x	0.7	=	19.15	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	104.39			0.63	x	0.7	=	17.55	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	92.85			0.63	x	0.7	=	15.61	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	69.27			0.63	x	0.7	=	11.64	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	44.07			0.63	x	0.7	=	7.41	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	31.49			0.63	x	0.7	=	5.29	(79)
Northwest _{0.9x}	0.77	X	7.5	55	x	11.28	X		0.63	X	0.7	=	26.03	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	22.97	X		0.63	x	0.7	=	52.99	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	41.38	X		0.63	x	0.7	=	95.48	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	67.96	X		0.63	X	0.7	=	156.8	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	91.35	X		0.63	x	0.7	=	210.77	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	97.38	X		0.63	x	0.7	=	224.7	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	91.1	X		0.63	x	0.7	=	210.2	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	72.63	X		0.63	x	0.7	=	167.58	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	50.42	X		0.63	x	0.7	=	116.34	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	28.07	X		0.63	X	0.7	=	64.76	(81)

Northwest 0.9x	0.77	x	7.5	55	x	14.2	x [0.63	X	0.7	=	32.76	(81)
Northwest 0.9x	0.77	x	7.5	55	x	9.21	_ x [0.63	×	0.7	=	21.26	(81)
Rooflights 0.9x	1	x	1.0)1	x	16.37	x [0.63	x	0.7		6.56	(82)
Rooflights 0.9x	1	x	1.0)1	x	33.68	x [0.63	X	0.7	=	13.5	(82)
Rooflights 0.9x	1	x	1.0)1	x	62.13	x [0.63	x	0.7	-	24.91	(82)
Rooflights 0.9x	1	x	1.0)1	X	104.87	x	0.63	x	0.7	=	42.04	(82)
Rooflights 0.9x	1	x	1.0)1	X	143.66	x	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	x	1.0)1	X	154.33	×	0.63	x	0.7	-	61.87	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.9	x	0.63	x	0.7	=	57.69	(82)
Rooflights 0.9x	1	x	1.0)1	X	113.05	×	0.63	X	0.7	_	45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	x	0.63	x	0.7	_	30.69	(82)
Rooflights 0.9x	1	x	1.0)1	x	41.49	x	0.63	X	0.7	-	16.63	(82)
Rooflights 0.9x	1	X	1.0)1	x	20.65	X	0.63	x	0.7	_	8.28	(82)
Rooflights 0.9x	1	x	1.0)1	x	13.34	×	0.63	x	0.7	-	5.35	(82)
							_						
Solar gains i	n watts, c	alculated	for eacl	h month			(83)m	= Sum(74)m .	(82)m			-	
(83)m= 130.8		349.43	482.64	586.24	602.16		491.7	73 395.04	266.41	158.75	110.71		(83)
Total gains –	· internal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts						1	
(84)m= 575.9	4 676.8	777.87	887.69	967.41	960.39	915.54	841.3	756.69	651.67	571.16	543.6		(84)
7. Mean into	ernal temp	perature	(heating	season)								
Temperatur	e during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
							,	(-)					
Utilisation fa	actor for g	ains for I	iving are	ea, h1,m	(see T		ŕ	()					
Utilisation fa		ains for I Mar	iving are Apr	ea, h1,m May	(see T Jun		Au		Oct	Nov	Dec		
					<u> </u>	able 9a)	1	g Sep	Oct 0.93	Nov 0.98	Dec 0.99		(86)
(86)m= 0.99	Feb 0.98	Mar 0.95	Apr 0.89	May 0.78	Jun 0.62	Jul 0.48	Au 0.53	g Sep 3 0.76		+			(86)
Jan	Feb 0.98	Mar 0.95	Apr 0.89	May 0.78	Jun 0.62	Jul 0.48	Au 0.53	g Sep 3 0.76		+			(86)
(86)m= 0.99 Mean interr (87)m= 21	Feb 0.98 nal temper	Mar 0.95 rature in	Apr 0.89 living are	May 0.78 ea T1 (fo	Jun 0.62 ollow sto 21	Jul 0.48 eps 3 to 7	Au 0.53 7 in Ta 21	g Sep 3 0.76 able 9c)	0.93	0.98	0.99		
(86)m= 0.99 Mean interr	Feb 0.98 nal temper 21 re during h	Mar 0.95 rature in	Apr 0.89 living are	May 0.78 ea T1 (fo	Jun 0.62 ollow sto 21	Jul 0.48 eps 3 to 7	Au 0.53 7 in Ta 21	g Sep 3 0.76 able 9c) 21 , Th2 (°C)	0.93	0.98	0.99		
(86)m= 0.99 Mean interr (87)m= 21 Temperatur (88)m= 19.92	Feb 0.98 nal temper 21 re during h	Mar 0.95 rature in 21 neating p 19.93	Apr 0.89 living are 21 eriods ir 19.94	May 0.78 ea T1 (for 21) rest of 19.95	Jun 0.62 ollow ste 21 dwellin 19.96	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96	Au 0.537 in Ta 21 able 9 19.9	g Sep 3 0.76 able 9c) 21 , Th2 (°C)	0.93	0.98	0.99		(87)
Mean interr (87)m= 21 Temperatur (88)m= 19.92 Utilisation fa	Feb 0.98 nal temper 21 re during h 19.93 actor for g	Mar 0.95 rature in 21 neating p 19.93 ains for r	Apr 0.89 living are 21 eriods ir 19.94	May 0.78 ea T1 (for 21 rest of 19.95 welling,	Jun 0.62 bllow sto 21 dwelling 19.96 h2,m (s	Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table	Au 0.53 7 in Ta 21 able 9 19.9 9a)	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95	0.93 21 19.95	0.98	0.99		(87)
Jan (86)m= 0.99	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97	Mar 0.95 rature in 21 neating p 19.93 ains for r 0.94	Apr 0.89 living are 21 eriods ir 19.94 rest of do	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73	Jun 0.62 ollow sto 21 dwelling 19.96 h2,m (s	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37	Au 0.537 in Ta 21 able 9 19.9 9a) 0.42	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95	0.93 21 19.95	0.98	0.99		(87)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper	Mar 0.95 rature in 21 neating p 19.93 ains for r 0.94	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelli	Jun 0.62 bllow ste 21 dwelling 19.96 h2,m (s 0.54 ng T2 (able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste	Au 0.537 in Ta 21 able 9 19.9 9a) 0.42	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Table	0.93 21 19.95 0.91 e 9c)	0.98 21 19.94 0.97	0.99 21 19.94 0.99		(87) (88) (89)
Jan (86)m= 0.99	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper	Mar 0.95 rature in 21 neating p 19.93 ains for r 0.94	Apr 0.89 living are 21 eriods ir 19.94 rest of do	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73	Jun 0.62 ollow sto 21 dwelling 19.96 h2,m (s	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37	Au 0.537 in Ta 21 able 9 19.9 9a) 0.42	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 to 7 in Table 6 19.95	0.93 21 19.95 0.91 e 9c) 19.95	0.98 21 19.94 0.97	0.99 21 19.94 0.99		(87) (88) (89) (90)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper	Mar 0.95 rature in 21 neating p 19.93 ains for r 0.94	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelli	Jun 0.62 bllow ste 21 dwelling 19.96 h2,m (s 0.54 ng T2 (able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste	Au 0.537 in Ta 21 able 9 19.9 9a) 0.42	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 to 7 in Table 6 19.95	0.93 21 19.95 0.91 e 9c) 19.95	0.98 21 19.94 0.97	0.99 21 19.94 0.99	0.27	(87) (88) (89)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 19.93	Mar 0.95 rature in 1 21 neating p 19.93 ains for r 0.94 rature in 1 19.93	Apr 0.89 living are 21 eriods ir 19.94 rest of de 0.87 the rest 19.94	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling, 19.95	Jun 0.62 Dillow sto 21 dwelling 19.96 h2,m (s 0.54 ng T2 (able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3	g Sep 0.76 able 9c) 21 Th2 (°C) 6 19.95 0.69 to 7 in Table 19.95	0.93 21 19.95 0.91 e 9c) 19.95	0.98 21 19.94 0.97	0.99 21 19.94 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 19.93	Mar 0.95 rature in 1 21 neating p 19.93 ains for r 0.94 rature in 1 19.93	Apr 0.89 living are 21 eriods ir 19.94 rest of de 0.87 the rest 19.94	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling, 19.95	Jun 0.62 Dillow sto 21 dwelling 19.96 h2,m (s 0.54 ng T2 (able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Tabl 6 19.95	0.93 21 19.95 0.91 e 9c) 19.95	0.98 21 19.94 0.97	0.99 21 19.94 0.99	0.27	(87) (88) (89) (90)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 19.93 nal temper 20.22 tment to t	Mar 0.95 rature in 1 21 neating p 19.93 ains for r 0.94 rature in 1 19.93	Apr 0.89 living are 21 eriods ir 19.94 rest of de 0.87 the rest 19.94 r the wh 20.23	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 ole dwe 20.23	Jun 0.62 ollow sto 21 dwelling 19.96 h2,m (s) 0.54 ng T2 (19.96 lling) = 20.24	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Tabl 6 19.95	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi	0.98 21 19.94 0.97 19.94 ng area ÷ (4	0.99 21 19.94 0.99 19.94	0.27	(87) (88) (89) (90) (91) (92)
Jan	Feb 0.98 all temper 21 e during h 19.93 actor for g 0.97 hal temper 19.93 hal temper 20.22 tment to t 20.22	Mar 0.95 rature in 1 21 neating p 19.93 ains for r 0.94 rature in 1 19.93 rature (fo 20.22 he mean 20.22	Apr 0.89 living are 21 eriods ir 19.94 rest of de 0.87 the rest 19.94 r the wh 20.23	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 ole dwe 20.23	Jun 0.62 ollow sto 21 dwelling 19.96 h2,m (s) 0.54 ng T2 (19.96 lling) = 20.24	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Tabl 6 19.95 - fLA) × T2 4 20.24 where approximation in the second se	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi	0.98 21 19.94 0.97 19.94 ng area ÷ (4	0.99 21 19.94 0.99 19.94	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 19.93 nal temper 20.22 tment to t 20.22 cating required	Mar 0.95 rature in 19.93 ains for r 0.94 rature in 19.93 rature (fo 20.22 he mean 20.22 uirement	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87 the rest 19.94 r the wh 20.23 internal 20.23	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 cole dwe 20.23 I temper 20.23	Jun 0.62 ollow ste 21 dwelling 19.96 h2,m (s 0.54 ng T2 (19.96 lling) = 20.24 ature fre 20.24	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24 om Table 20.24	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2 4e, w 20.2	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Table 6 19.95 4 20.24 where approx	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi 20.23 ppriate 20.23	0.98 21 19.94 0.97 19.94 ng area ÷ (4) 20.23	0.99 21 19.94 0.99 19.94 1) =		(87) (88) (89) (90) (91) (92)
Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 21 220.22 temper 20.22	Mar 0.95 rature in 1 19.93 ains for r 0.94 rature in 1 19.93 rature (for 20.22 ternal terna	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87 the rest 19.94 r the wh 20.23 internal 20.23	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 cole dwe 20.23 temper 20.23 re obtain	Jun 0.62 ollow ste 21 dwelling 19.96 h2,m (s 0.54 ng T2 (19.96 lling) = 20.24 ature fre 20.24	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24 om Table 20.24	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2 4e, w 20.2	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Table 6 19.95 4 20.24 where approx	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi 20.23 ppriate 20.23	0.98 21 19.94 0.97 19.94 ng area ÷ (4) 20.23	0.99 21 19.94 0.99 19.94 1) =		(87) (88) (89) (90) (91) (92)
Mean interr (92)m= 20.22 Apply adjus (93)m= 20.22 Set Ti to the utilisation	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 20.22 tement to t 20.22 eating requesting re	Mar 0.95 rature in 19.93 ains for r 0.94 rature in 1 19.93 rature (fo 20.22 he mean 20.22 uirement ternal terror gains of the second sec	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87 the rest 19.94 r the wh 20.23 internal 20.23	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 cole dwe 20.23 temper 20.23 re obtain able 9a	Jun 0.62 ollow sterms 21 dwelling 19.96 h2,m (s 0.54 ng T2 (19.96 lling) = 20.24 ature free 20.24 med at s	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24 com Table 20.24 tep 11 of	Au 0.53 7 in Ta able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2 24e, v 20.2	g Sep 3 0.76 able 9c) 21 Th2 (°C) 6 19.95 c 0.69 to 7 in Table 6 19.95 -fLA) × T2 4 20.24 where appro4 2 9b, so tha	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi 20.23 ppriate 20.23	0.98 21 19.94 0.97 19.94 ng area ÷ (4) 20.23 (76)m and	0.99 21 19.94 0.99 19.94 19.94 20.23 20.23		(87) (88) (89) (90) (91) (92)
Mean interr (87)m= 21 Temperatur (88)m= 19.92 Utilisation fa (89)m= 0.98 Mean interr (90)m= 19.92 Mean interr (92)m= 20.22 Apply adjus (93)m= 20.22 8. Space he Set Ti to the the utilisatio Jan	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 19.93 nal temper 20.22 tement to t 20.22 exting requesting reques	Mar 0.95 rature in 19.93 ains for r 0.94 rature in 19.93 rature (fo 20.22 he mean 20.22 uirement ternal ter or gains of Mar	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87 the rest 19.94 r the wh 20.23 internal 20.23 mperaturusing Ta Apr	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 cole dwe 20.23 temper 20.23 re obtain	Jun 0.62 ollow ste 21 dwelling 19.96 h2,m (s 0.54 ng T2 (19.96 lling) = 20.24 ature fre 20.24	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24 om Table 20.24	Au 0.53 7 in Ta 21 able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2 4e, w 20.2	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Tabl 6 19.95 - fLA) × T2 4 20.24 where appro4 20.24	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi 20.23 ppriate 20.23	0.98 21 19.94 0.97 19.94 ng area ÷ (4) 20.23	0.99 21 19.94 0.99 19.94 1) =		(87) (88) (89) (90) (91) (92)
Mean interr (92)m= 20.22 Apply adjus (93)m= 20.22 Set Ti to the utilisation	Feb 0.98 nal temper 21 re during h 19.93 actor for g 0.97 nal temper 19.93 nal temper 20.22 tement to t 20.22 exting requesting reques	Mar 0.95 rature in 19.93 ains for r 0.94 rature in 19.93 rature (fo 20.22 he mean 20.22 uirement ternal ter or gains of Mar	Apr 0.89 living are 21 eriods ir 19.94 rest of do 0.87 the rest 19.94 r the wh 20.23 internal 20.23 mperaturusing Ta Apr	May 0.78 ea T1 (for 21 n rest of 19.95 welling, 0.73 of dwelling 19.95 cole dwe 20.23 temper 20.23 re obtain able 9a	Jun 0.62 ollow sterms 21 dwelling 19.96 h2,m (s 0.54 ng T2 (19.96 lling) = 20.24 ature free 20.24 med at s	able 9a) Jul 0.48 eps 3 to 7 21 g from Ta 19.96 ee Table 0.37 follow ste 19.96 fLA × T1 20.24 com Table 20.24 tep 11 of	Au 0.53 7 in Ta able 9 19.9 9a) 0.42 eps 3 19.9 + (1 - 20.2 24e, v 20.2	g Sep 3 0.76 able 9c) 21 , Th2 (°C) 6 19.95 2 0.69 to 7 in Tabl 6 19.95 4 20.24 where appro4 20.24 g Sep	0.93 21 19.95 0.91 e 9c) 19.95 LA = Livi 20.23 ppriate 20.23	0.98 21 19.94 0.97 19.94 ng area ÷ (4) 20.23 (76)m and	0.99 21 19.94 0.99 19.94 19.94 20.23 20.23		(87) (88) (89) (90) (91) (92)

Useful gains, hn	O 141 10		4.									
(05)	<u> </u>	, ` ` `		544.00	000.40	000.70	507.04	504.04	555.75	500.0		(OE)
(95)m= 566.95 6 Monthly average	57.9 734.81	778.28	723.59	541.23	368.16	382.72	537.31	594.31	555.75	536.6		(95)
 _	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 fo	r mean inter	nal tempe	erature,	L Lm , W =	=[(39)m :	x [(93)m	 – (96)m	1				
(97)m= 1714.62 16		1195.05		585.63	378.05	398	640.42	1013.12	1388.65	1704.97		(97)
Space heating re	equirement for	or each n	nonth, k\	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	 1)m			
	53.31 546.07	300.07	129.34	0	0	0	0	311.6	599.69	869.27		
	•	•				Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	4273.21	(98)
Space heating re	equirement in	n kWh/m²	² /year								47.44	(99)
9a. Energy requir	ements – Inc	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:										г		
Fraction of spac				mentary	•	(202) – 4	(204) -			Ļ	0	(201)
Fraction of spac		-	` '			(202) = 1	, ,			Ļ	1	(202)
Fraction of total	•	•				(204) = (2	02) × [1 –	(203)] =		Ĺ	11	(204)
Efficiency of ma	in space hea	ting syste	em 1							Ĺ	240.46	(206)
Efficiency of sec	ondary/supp	lementar	y heating	g system	າ, %						0	(208)
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating r	equirement (calculate	d above)								
853.87 66	53.31 546.07	300.07	129.34	0	0	0	0	311.6	599.69	869.27		
$(211)m = \{[(98)m]$	x (204)] } x	100 ÷ (20	06)									(211)
355.1 27	75.85 227.09	124.79	53.79	0	0	0	^	129.58	249.39	361.5		
<u> </u>			000	U	U		0					_
		Į.	000	0	U		_		211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1777.1	(211)
Space heating for	`	• , ,		0	U		_				1777.1	(211)
= {[(98)m x (201)]	} x 100 ÷ (2	08)	month			Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	1777.1	(211)
	`	• , ,		0	0	Tota 0	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	0		_
$= \{[(98)m \times (201)] $ $(215)m = 0$	} x 100 ÷ (2	08)	month			Tota 0	I (kWh/yea	ar) =Sum(2	0	<u> </u>	1777.1	(211)
= {[(98)m x (201)] (215)m= 0) x 100 ÷ (20 0 0	08)	month 0			Tota 0	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	0		_
= {[(98)m x (201)] (215)m= 0) x 100 ÷ (20 0 0	08) 0	month 0 bove)	0	0	Tota 0 Tota	0 (kWh/yea	0 0ar) =Sum(2	0	0		_
= {[(98)m x (201)] (215)m= 0	x 100 ÷ (20 0 0 r heater (calconders) 9.14 88.29	08)	month 0			Tota 0	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	0	0	(215)
= {[(98)m x (201)] (215)m= 0	x 100 ÷ (20 0 0 r heater (calconders) 9.14 88.29	08) 0	month 0 bove)	0	0	Tota 0 Tota	0 (kWh/yea	0 0ar) =Sum(2	0	0		_
= {[(98)m x (201)] (215)m= 0	x 100 ÷ (20 0 0 r heater (calconder) 9.14 88.29 r heater 88.96 188.96	08) 0 culated a 78.38	0 bove)	0 145.78	140	0 Tota 153.68	0 I (kWh/yea 153.41	0 ar) =Sum(2 82.79	0 215) _{15,1012}	0 89.73	0	(215)
= {[(98)m x (201)] (215)m= 0 Water heating Output from water 93.14 7 Efficiency of water (217)m= 188.96 18 Fuel for water heat (219)m = (64)m	r heater (calcount) r heater (calcount) 9.14 88.29 r heater 88.96 188.96 ating, kWh/m	08) 0 culated a 78.38 188.96 onth)m	month 0 bove) 108.1	0 145.78 188.96	0 140 188.96	0 Tota 153.68	0 I (kWh/yea 153.41	0 er) =Sum(2 82.79 188.96	0 215) _{15,1012}	0 89.73	0	(215)
= {[(98)m x (201)] (215)m= 0	r heater (calcount) r heater (calcount) 9.14 88.29 r heater 88.96 188.96 ating, kWh/m	08) 0 culated a 78.38 188.96 onth	0 bove)	0 145.78	140	Tota 0 Tota 153.68 188.96	0 I (kWh/yea 153.41 188.96	0 ar) =Sum(2 82.79 188.96	0 215) _{15,1012}	0 89.73	188.96	(215) (216) (217)
= {[(98)m x (201)] (215)m= 0 Water heating Output from water 93.14 7 Efficiency of water (217)m= 188.96 18 Fuel for water heat (219)m = (64)m (219)m= 49.29 4	r heater (calcount) r heater (calcount) 9.14 88.29 r heater 88.96 188.96 ating, kWh/m x 100 ÷ (217	08) 0 culated a 78.38 188.96 onth)m	month 0 bove) 108.1	0 145.78 188.96	0 140 188.96	Tota 0 Tota 153.68 188.96	0 I (kWh/yea 153.41 188.96	0 ar) =Sum(2 82.79 188.96 43.81 19a) ₁₁₂ =	0 215) _{15,1012} 84.86 188.96	89.73 188.96	0 188.96 686.56	(215) (216) (217) (219)
= {[(98)m x (201)] (215)m= 0 Water heating Output from water 93.14 7 Efficiency of water (217)m= 188.96 18 Fuel for water heater (219)m = (64)m (219)m= 49.29 4	r heater (calconders) r heater (calconders) r heater 88.29 r heater 88.96 188.96 ating, kWh/m x 100 ÷ (217 1.88 46.73	08) 0 culated a 78.38 188.96 onth)m 41.48	month 0 bove) 108.1 188.96	0 145.78 188.96	0 140 188.96	Tota 0 Tota 153.68 188.96	0 I (kWh/yea 153.41 188.96	0 ar) =Sum(2 82.79 188.96 43.81 19a) ₁₁₂ =	0 215) _{15,1012} 84.86	89.73 188.96	0 188.96 686.56 kWh/yea	(215) (216) (217) (219)
= {[(98)m x (201)] (215)m= 0 Water heating Output from water 93.14 7 Efficiency of water (217)m= 188.96 18 Fuel for water heating fuel (219)m= 49.29 4 Annual totals Space heating fuel	r heater (calconders) r heater (calconders) r heater 88.29 r heater 88.96 188.96 ating, kWh/m x 100 ÷ (217 1.88 46.73	08) 0 culated a 78.38 188.96 onth)m 41.48	month 0 bove) 108.1 188.96	0 145.78 188.96	0 140 188.96	Tota 0 Tota 153.68 188.96	0 I (kWh/yea 153.41 188.96	0 ar) =Sum(2 82.79 188.96 43.81 19a) ₁₁₂ =	0 215) _{15,1012} 84.86 188.96	89.73 188.96	0 188.96 686.56	(215) (216) (217) (219)
= {[(98)m x (201)] (215)m= 0 Water heating Output from water 93.14 7 Efficiency of water (217)m= 188.96 18 Fuel for water heater (219)m = (64)m (219)m= 49.29 4	r heater (calconders) r heater (calconders) r heater 88.29 r heater 88.96 188.96 ating, kWh/m x 100 ÷ (217 1.88 46.73	08) 0 culated a 78.38 188.96 onth)m 41.48	month 0 bove) 108.1 188.96	0 145.78 188.96	0 140 188.96	Tota 0 Tota 153.68 188.96	0 I (kWh/yea 153.41 188.96	0 ar) =Sum(2 82.79 188.96 43.81 19a) ₁₁₂ =	0 215) _{15,1012} 84.86 188.96	89.73 188.96	0 188.96 686.56 kWh/yea	(215) (216) (217) (219)
= {[(98)m x (201)] (215)m= 0 Water heating Output from water 93.14 7 Efficiency of water (217)m= 188.96 18 Fuel for water heating fuel (219)m= 49.29 4 Annual totals Space heating fuel	r heater (calconding) r heater (calconding) r heater 88.29 r heater 88.96 188.96 ating, kWh/m x 100 ÷ (217 1.88 46.73	08) 0 culated a 78.38 188.96 onth)m 41.48	month 0 bove) 108.1 188.96	0 145.78 188.96 77.15	0 140 188.96	Tota 0 Tota 153.68 188.96	0 I (kWh/yea 153.41 188.96	0 ar) =Sum(2 82.79 188.96 43.81 19a) ₁₁₂ =	0 215) _{15,1012} 84.86 188.96	89.73 188.96	0 188.96 686.56 kWh/yea 1777.1	(215) (216) (217) (219)

Electricity for lighting (232)380.53 (233) Electricity generated by PVs -1086.82 Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 1757.36 (338)12a. CO2 emissions – Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) 0.519 922.31 (261)Space heating (secondary) (215) x (263)0.519 0 Water heating (219) x (264)0.519 356.32 (261) + (262) + (263) + (264) =Space and water heating 1278.64 (265)(231) x Electricity for pumps, fans and electric keep-hot (267)0.519 0 (232) x Electricity for lighting 0.519 197.49 (268)Energy saving/generation technologies Item 1 (269)0.519 -564.06 sum of (265)...(271) = Total CO2, kg/year 912.07 (272) $(272) \div (4) =$ **Dwelling CO2 Emission Rate** (273)10.13

El rating (section 14)

(274)

91

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41

Printed on 16 June 2021 at 14:57:15

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.08m²

Site Reference: 119 East Road -GREEN

Plot Reference: Sample 3

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.96 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.48 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²

OK 2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.14 (max. 0.25) 0.14 (max. 0.70) **OK** Roof 0.11 (max. 0.20) 0.12 (max. 0.35) OK **Openings** 1.20 (max. 2.00) 1.20 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 8.5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.47 kWh/day

Permitted by DBSCG: 2.24 kWh/day OK

Regulations Compliance Report

Primary pipework insulated:	Yes		ок
6 Controls			
Space heating controls	TTZC by plumbing and e	ectrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle	ey):	Medium	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: North West		7.55m²	
Windows facing: South East		8.19m²	
Windows facing: South West		0.55m²	
Roof windows facing: North W	est	1.01m²	
Ventilation rate:		4.00	
10 Key features		0.40.004	
Roofs U-value		0.12 W/m²K	
Party Walls U-value		0 W/m²K	

Photovoltaic array

			User D	etails:						
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12		Softwa	are Ver	sion:		Versio	n: 1.0.5.41	
		Р	roperty <i>i</i>	Address	Sample	3				
Address: 1. Overall dwelling dime	nsions:									
1. Overall dwelling diffie	11510115.		Area	a(m²)		Av. He	iaht(m)		Volume(m³))
Ground floor				3.34	(1a) x		2.4	(2a) =	80.02	(3a)
First floor			3	3.34	(1b) x	2	2.7	(2b) =	90.02	(3b)
Second floor				23.4	(1c) x	2	.26	(2c) =	52.88	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 9	0.08	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	222.92	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	_ + _	0	_ = _	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent far	ns				Ī	3	x	10 =	30	(7a)
Number of passive vents					Ī	0	x	10 =	0	(7b)
Number of flueless gas fir	res				Ī	0	X 4	40 =	0	(7c)
								A in ah	anaaa nar ba	_
Infiltration due to chimney	ve fluor and fans - (f	3a)+(6h)+(7	/a)+(7h)+(7c) =	Г				nanges per ho	_
If a pressurisation test has be					continue fr	30 om (9) to (÷ (5) =	0.13	(8)
Number of storeys in th		.,	, ,,			, , ,	,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber	frame or	0.35 for	masonı	y constr	uction			0	(11)
if both types of wall are producting areas of openin		sponding to	the great	er wall are	a (after					
If suspended wooden fl		iled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	ur per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.38	(18)
Air permeability value applies		s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered Shelter factor	d			(20) = 1 -	IO 075 v (1	0)1 =			0	(19)
	ing aboltor factor			,	`	J)] -			1	(20)
Infiltration rate incorporati Infiltration rate modified for	-	d		(21) = (18	, ^ (20) -				0.38	(21)
	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		1 0011		, .ug	L COP		1	1 200	I	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		1		<u> </u>			<u> </u>		I	

Wind Fa	actor (2	2a)m =	(22)m ÷	4				•		,		,			
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	ation rate	e (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m						
[0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.38	0.41	0.43	0.45			
		<i>tive air</i> d al ventila	•	rate for t	he appli	cable ca	se							0	(23a
_				endix N, (2	.3b) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)				0	(23b
If balaı	nced with	heat reco	very: effic	eiency in %	allowing f	or in-use f	actor (fror	n Table 4h) =					0	(23c
a) If b	oalance	d mecha	anical ve	entilation	with hea	at recov	ery (MV	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 b	palance	d mecha	anical ve	entilation	without	heat red	covery (I	MV) (24b)m = (2:	2b)m + (23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b
,					•	•		on from o							
Г	<u> </u>			· ·	ŕ		<u> </u>	c) = (22b	 	· ·	<u> </u>		ı		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,					•			on from I 0.5 + [(2		0.51					
(24d)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6]		(24d
` ′ L								ld) in box					l		Ì
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6			(25)
0 11	. ()				<u>l</u>	<u> </u>				<u> </u>			l		
ਤ. ਜea	ar insse														
				paramet Openin		Not Ar	-02	l I_valı	10	ΔΥΠ		k_value	<u>.</u>	ΔΥ	k
ELEM		Gros area	ss	paramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	<)	k-value kJ/m²·ł		A X kJ/K	
		Gros	ss	Openin	gs		m²			_	<) 				
ELEM	ENT	Gros area	ss	Openin	gs	A ,r	m² x	W/m2	2K =	(W/	<) 				
ELEM Doors	I ENT vs Type	Gros area	ss	Openin	gs	A ,r	m ² x x1	W/m2	eK = 0.04] =	(W/ 2.736	<) 				(26)
ELEM Doors Window	IENT vs Type vs Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55	m ² x x1 x1	W/m2 1.2 /[1/(1.2)+	0.04] =	(W/) 2.736 8.65	<) 				(26)
ELEM Doors Window Window	VS Type VS Type VS Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38	<)				(26) (27) (27)
ELEM Doors Window Window Window	VS Type VS Type VS Type	Gros area	ss	Openin	gs	A ,r 2.28 7.55 8.19	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	2.736 8.65 9.38 0.63					(26) (27) (27) (27)
Doors Window Window Window Roofligh	VS Type VS Type VS Type VS Type hts	Gros area	es (m²)	Openin	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01	x1 x1 x1 x1 x1 x1	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212		kJ/m²·l		kJ/K	(26) (27) (27) (27) (27b)
ELEM Doors Window Window Window Roofligh Floor	vs Type vs Type vs Type hts	Gros area 1 2 2	ss (m²)	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34	x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676		kJ/m²·l		kJ/K 3667.4	(26) (27) (27) (27) (27b) (28)
Doors Window Window Window Roofligh Floor Walls T	vs Type vs Type vs Type hts ype1 ype2	Gros area 1 2 2 3	68 2	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18	0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		410 60		3667.4 6606.6	(26) (27) (27) (27) (27b (28) (29)
Doors Window Window Roofligh Floor Walls T	vs Type vs Type vs Type hts ype1 ype2 ype1	Gros area 1 2 3 128.6	68 2 9 9	Openin m	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62	X X1 X1 X1 X1 X X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82		110 60 9		3667.4 6606.6 59.58	(26) (27) (27) (27) (27b (28) (29)
Doors Window Window Roofligh Floor Walls T Walls T Roof T	vs Type vs Type vs Type hts ype1 ype2 ype1 ype2	Gros area 1 2 3 128.6 6.62 25.5	68 2 9	18.5 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58	X X1 X1 X1 X1 X X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95		110 60 9		3667.4 6606.6 59.58 221.22	(26) (27) (27) (27) (27b (28) (29) (29) (30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T	vs Type vs Type vs Type hts ype1 ype2 ype1 ype2 ype3	Gros area 1	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22	X X1 X1 X1 X1 X1 X X X	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98	(26) (27) (27) (27) (27b (28) (29) (29) (30) (30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T	vs Type vs Type thts Type1 Type2 Type2 Type3 Type3 Type3 of e	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2) + 0.14 0.18 0.12 0.1	2K = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98	(26) (27) (27) (27) (27b (28)](29)](29)](30)](30)
Doors Window Window Window Roofligh Floor Walls T Walls T Roof T Roof T Roof T Roof T Total ar	vs Type vs Type vs Type thts ype1 ype2 ype1 ype2 ype3 rea of e	Gros area 1 2 3 128.6 6.62 25.5 6.22	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27b (28)](29)](30)](30) (31)](32)
ELEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Roof T Total ar Party w	vs Type vs Type vs Type thts Type1 Type2 Type2 Type3 Type3 Trea of e vall I wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22 3.72	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27) (28)](29)](30)](30) (31)
ELEM Doors Window Window Roofligh Floor Walls T Roof T Roof T Roof T Total ar Party w Internal	vs Type vs Type vs Type thts Type1 Type2 Type3 rea of e vall I wall **	Gros area 1 2 3 128.6 6.62 25.5 6.22 3.72	68 2 9 2	18.5 0 1.01	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.34 110.1 6.62 24.58 6.22 3.72 204.1 39.26	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	2K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62		110 60 9 9 9 9		3667.4 6606.6 59.58 221.22 55.98 33.48 1766.7 859.5	(26) (27) (27) (27) (27b (28)](29)](30)](30) (31)](32)](32c
Doors Vindow Vindow Vindow Roofligh Floor Valls T Roof T Roof T Roof T Roof T rotal ar Party w nternal nternal	vs Type vs Type vs Type thts Type1 Type2 Type3 rea of e vall I wall ** I floor I ceiling	Gros area 1 2 3 128.6 6.62 25.5 6.22 3.72 Ilements	68 2 9 2 2 , m²	18.5 0 1.01 0	gs 1 ²	A ,r 2.28 7.55 8.19 0.55 1.01 33.3 ² 110.1 6.62 24.58 6.22 3.72 204.1 39.26 95.5 56.7 ²	m ²	W/m2 1.2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.14 0.18 0.18 0.10 0.10	eK = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = =	(W// 2.736 8.65 9.38 0.63 1.212 4.6676 19.82 1.19 2.95 0.62 0.34		110 60 9 9 9 9 18 9		3667.4 6606.6 59.58 221.22 55.98 33.48	(26) (27) (27) (27) (27) (28)](29)](30) [(30) (31)](32)](32)

(26)...(30) + (32) =

Fabric heat loss, W/K = S (A x U)

52.14

(33)

Heat capacity	cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	14802.44	(34)
Thermal mass			P = Cm ÷	· TFA) in	n kJ/m²K			= (34)	÷ (4) =			164.33	(35)
For design asses	•	`		,			ecisely the	indicative	values of	TMP in Ta	able 1f	104.00	(00)
can be used inste	ead of a de	tailed calcu	ulation.			·	·						
Thermal bridg	ges : S (L	xY) cal	culated ι	using Ap	pendix I	K						17.27	(36)
if details of therm	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he	eat loss							(33) +	(36) =			69.41	(37)
Ventilation he	at loss ca	alculated	monthly	У	_	_		(38)m	= 0.33 × (25)m x (5)		•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 45.62	45.28	44.94	43.36	43.07	41.69	41.69	41.44	42.22	43.07	43.67	44.29		(38)
Heat transfer	coefficier	nt, W/K			•			(39)m	= (37) + (3	38)m		•	
(39)m= 115.03	114.69	114.35	112.77	112.48	111.1	111.1	110.85	111.63	112.48	113.08	113.7		
Heat loss para	ameter (F		/m²K		•	•			Average = = (39)m ÷	` '	12 /12=	112.77	(39)
(40)m= 1.28	1.27	1.27	1.25	1.25	1.23	1.23	1.23	1.24	1.25	1.26	1.26		
(10)	1/	1.27	1.20	1.20	1.20	1.20	120		Average =			1.25	(40)
Number of da	ys in moi	nth (Tabl	le 1a)					,	werage	Odm(40)1.	12712	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)
		<u> </u>			<u>[</u>	<u> </u>							
4 Water bea	ting one	~~									Id Mb /v	2011	
4. Water hea	aung ener	rgy requi	rement.								kWh/y	dar.	
Assumed occ if TFA > 13			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	ΓFA -13.		63		(42)
if TFA > 13. if TFA £ 13.	.9, N = 1 .9, N = 1	+ 1.76 x	-		·		, , -		ΓFA -13.		63		(42)
if TFA > 13. if TFA £ 13. Annual avera	.9, N = 1 .9, N = 1 ge hot wa	+ 1.76 x ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		9)	.59		(42)
if TFA > 13. if TFA £ 13.	.9, N = 1 .9, N = 1 ge hot wa al average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)			` ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125.	.9, N = 1 .9, N = 1 ge hot wa lal average 5 litres per l	+ 1.76 x ater usag	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av lwelling is not and co	erage = designed t ld)	(25 x N) o achieve	+ 36 a water us	e target o	9) 96	.59		` ,
if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 129 Jan	.9, N = 1 .9, N = 1 ge hot wa lal average 5 litres per l	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36		9)			` ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	9, N = 1 9, N = 1 ge hot water a large sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d rater use, f May Vd,m = fac	ay Vd,av	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43)	+ 36 a water us Sep	e target of	9) 96 Nov	.59 Dec		` ,
if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 129 Jan	9, N = 1 9, N = 1 ge hot water a large sper per per per per per per per per per	+ 1.76 x ater usag hot water person per	ge in litre usage by s day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) o achieve Aug	+ 36 a water us Sep	Oct 98.52	9) 96 Nov 102.38	.59 Dec 106.25	1150.04	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	9, N = 1 9, N = 1 ge hot was all average filtres per p Feb in litres per	+ 1.76 x ater usag hot water person per Mar r day for ea	ge in litre usage by s day (all w Apr ach month 94.66	es per da 5% if the d vater use, h May Vd,m = fac 90.79	ay Vd,av lwelling is not and co. Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Fotal = Sui	9) Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	` ,
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea	ge in litre usage by s day (all w Apr ach month 94.66	es per da 5% if the d rater use, h May Vd,m = fac 90.79	ay Vd,av lwelling is not and co. Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) o achieve Aug (43) 90.79	+ 36 a water us Sep	Oct 98.52 Fotal = Sui	9) Nov 102.38 m(44) ₁₁₂ =	Dec 106.25	1159.04	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56	9, N = 1 9, N = 1 ge hot water sper properties for litres per properties per properties for litr	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4.	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Suith (see Tai	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59	1159.04 1519.69	(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of	9, N = 1 9, N = 1 ge hot water sper properties for litres per properties per properties for litr	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4.	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous (46)m= 23.63	9, N = 1 9, N = 1 ge hot water later sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2	ge in litre usage by a day (all w Apr ach month 94.66	es per da 5% if the d sater use, h May Vd,m = fact 90.79 onthly = 4.	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12	(25 x N) o achieve Aug (43) 90.79 97m / 3600 109.15	+ 36 a water us Sep 94.66 0 kWh/mon	Oct 98.52 Fotal = Sur th (see Ta	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51	.59 Dec 106.25 c, 1d) 152.59		(43)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous (46)m= 23.63 Water storage	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar aday for ear 98.52 used - calc 142.2 ng at point 21.33	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the d ater use, h May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93 190 x Vd,r 102.65	erage = designed to designed t	(25 x N) o achieve Aug (43) 90.79 77m / 3600 109.15 boxes (46) 16.37	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ =	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous (46)m= 23.63 Water storage Storage volume	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar r day for ea 98.52 used - calc 142.2 ng at point 21.33 including	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the dater use, h May Vd,m = fact 90.79 onthly = 4. 118.95 o hot water 17.84 plar or W	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa	+ 36 a water us Sep 94.66 110.45 16.57	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59		(43) (44) (45)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volume If community	9, N = 1 9, N = 1 ge hot water sper in litres per in litres per in 102.38 102.38 102.38 water heating 20.67 e loss: me (litres)	the table of the table of the table of the table of table	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volume If community of Otherwise if not 150.	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	the table of the table of the table of the table of table	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av welling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous if (46)m= 23.63 Water storage Storage volumed If community of the water storage if in water storage if in water storage if in water storage.	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usag hot water person per Mar 98.52 used - calc 142.2 ng at point 21.33 including and no tal hot water	ge in litre usage by a day (all w Apr ach month 94.66 123.97 of use (not 18.6 ag any so unk in dw er (this in	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volunt of Community of	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	+ 1.76 x ater usage hot water person per Mar 98.52 used - calce 142.2 ang at point 21.33 including and no tale hot water person per beclared legerated to the colored legerated l	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no 18.6 ag any so ank in dw er (this in	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x E 95.12 enter 0 in 14.27 storage 0 litres in neous co	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/mor 110.45 0 to (61) 16.57 ame vess	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous is (46)m= 23.63 Water storage Storage volum If community of the wise if in Water storage a) If manufact Temperature	9, N = 1 9, N = 1 ge hot water sper in litres per in litre	the table water usage hot water usage hot water person per Mar 98.52 used - calc 142.2 ng at point 21.33 including and no tale hot water water usage hot water person per water usage has been as a constant of the color of th	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (not 18.6 and any so ank in dw er (this in oss facto 2b	es per da 5% if the d fater use, f May Vd,m = fat 90.79 onthly = 4. 118.95 o hot water 17.84 color or W relling, e facludes in or is known	ay Vd,av lwelling is not and co Jun ctor from 7 86.93 190 x Vd,r 102.65 storage), 15.4 /WHRS nter 110 nstantar	erage = designed to do	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47) ombi boil	+ 36 a water us Sep 94.66 0 kWh/more 110.45 0 to (61) 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89 200		(43) (44) (45) (46) (47) (48) (49)
if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128. Jan Hot water usage (44)m= 106.25 Energy content of (45)m= 157.56 If instantaneous of (46)m= 23.63 Water storage Storage volunt of Community of	9, N = 1 9, N = 1 ge hot water sper per per per per per per per per per	the trust of trust of the trust of	ge in litre usage by s day (all w Apr ach month 94.66 123.97 of use (no 18.6 ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the d ater use, f May Vd,m = fac 90.79 onthly = 4. 118.95 o hot water 17.84 colar or W velling, e acludes in or is knowear	ay Vd,av lwelling is not and co. Jun ctor from 7 86.93 190 x Vd,r 102.65 r storage), 15.4 /WHRS inter 110 nstantar	erage = designed to ld) Jul Table 1c x 86.93 m x nm x D 95.12 enter 0 in 14.27 storage 0 litres in neous con/day):	(25 x N) o achieve Aug (43) 90.79 7m / 3600 109.15 boxes (46) 16.37 within sa (47)	+ 36 a water us Sep 94.66 0 kWh/more 110.45 0 to (61) 16.57 ame vess ers) ente	Oct 98.52 Total = Sur 128.72 Total = Sur 19.31 Sel	9) Nov 102.38 m(44) ₁₁₂ = bles 1b, 1 140.51 m(45) ₁₁₂ = 21.08	.59 Dec 106.25 c, 1d) 152.59 22.89		(43) (44) (45) (46) (47)

Hot water stor	rage loss	factor fr	om Tabl	le 2 (kW	h/litre/da	ıy)					0		(51)
If community	•		on 4.3									•	
Volume factor											0		(52)
Temperature	tactor tro	m Table	2b								0		(53)
Energy lost fro		-	, kWh/ye	ear			(47) x (51)	x (52) x ((53) =	-	0		(54)
Enter (50) or	. , .	,								0.	79		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m	_	_		
(56)m= 24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(56)
If cylinder contain	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
Primary circui	t loss (an	nual) fro	om Table	e 3							0		(58)
Primary circui	t loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor fi	rom Tab	le H5 if t	here is s	olar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss ca	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 he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 205.43	181.04	190.07	170.3	166.83	148.98	142.99	157.02	156.78	176.59	186.84	200.46		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 113.77	102.9	102.79	92.49	70.26	3.19	2.99	3.34	3.37	94.36	102.93	112.14	ı	(63) (G2)
Output from w	<i>ı</i> ater hea	tor											
-	78.14	87.28	77.81	96.56	145.78	140	153.68	153.41	82.23	83.91	88.31		
	1	·	77.81	96.56	145.78	140			82.23 ater heate			1278.78	(64)
(64)m= 91.66	78.14	87.28					Outp	out from w	ater heate	I r (annual)₁	12		(64)
(64)m= 91.66 Heat gains from	78.14	87.28					Outp	out from w	ater heate	I r (annual)₁	12		(64) (65)
(64)m= 91.66 Heat gains fro (65)m= 90.68	78.14 om water 80.41	87.28 heating, 85.58	kWh/mo	onth 0.2:	5 ´ [0.85 71.19	× (45)m	Outr + (61)m 74.59	out from word + 0.8	ater heate x [(46)m	+ (57)m 83.78	+ (59)m 89.03]	1
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57)	78.14 om water 80.41 om in cald	heating, 85.58 culation o	kWh/mo 78.28 of (65)m	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outr + (61)m 74.59	out from word + 0.8	ater heate x [(46)m	+ (57)m 83.78	+ (59)m 89.03]	1
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal g	78.14 om water 80.41 om in calc ains (see	heating, 85.58 culation of	kWh/mo 78.28 of (65)m 5 and 5a	onth 0.29 77.85 only if c	5 ´ [0.85 71.19	× (45)m	Outr + (61)m 74.59	out from word + 0.8	ater heate x [(46)m	+ (57)m 83.78	+ (59)m 89.03]	1
Heat gains from (65)m= 90.68 include (57) 5. Internal gains Metabolic gain	78.14 om water 80.41 om in calc ains (see	heating, 85.58 culation of Table 5	kWh/mo 78.28 of (65)m 5 and 5a	onth 0.2: 77.85 only if c	5 ´ [0.85 71.19 ylinder is	× (45)m 69.92 s in the o	Outp + (61)m 74.59 dwelling	73.79 or hot w	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	1
Heat gains from (65)m= 90.68 include (57) 5. Internal grade Metabolic gain Jan	78.14 om water 80.41 om in calc ains (see ns (Table Feb	heating, 85.58 culation of Table 5 5), Wat	kWh/mo 78.28 of (65)m 5 and 5a ts Apr	onth 0.25 77.85 only if constant	5 ´ [0.85 71.19 ylinder is Jun	× (45)m 69.92 s in the o	Outs + (61)m 74.59 dwelling	out from w. 1] + 0.8 x 73.79 or hot w	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	(65)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gain Metabolic gain Jan (66)m= 131.34	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34	heating, 85.58 culation (Table 5 5), Wat Mar 131.34	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34	onth 0.23 77.85 only if co): May	5 ´ [0.85 71.19 ylinder is Jun 131.34	× (45)m 69.92 s in the o	Outp + (61)m 74.59 dwelling Aug 131.34	out from w 73.79 or hot w Sep 131.34	ater heate x [(46)m 81.1 vater is fr	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	1
Heat gains from (65)m= 90.68 include (57) 5. Internal grade Metabolic gain Jan (66)m= 131.34 Lighting gains	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 c (calcula	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34	onth 0.29 77.85 only if co May 131.34 L, equat	5 ´ [0.85 71.19 ylinder is Jun 131.34 ion L9 o	× (45)m 69.92 s in the o Jul 131.34 r L9a), a	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see	Sep 131.34 Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34	+ (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gradient Jan (66)m= 131.34 Lighting gains (67)m= 21.55	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap	kWh/mc 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix	onth 0.25 77.85 only if co May 131.34 L, equat 8.81	5 ´ [0.85 71.19 ylinder is Jun 131.34 ion L9 or	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03	Outs + (61)m 74.59 dwelling Aug 131.34 Iso see	Sep 131.34 Table 5	ater heate x [(46)m 81.1 vater is fr Oct 131.34	+ (57)m 83.78 rom com	+ (59)m 89.03 munity h]	(65)
Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78	onth 0.2: 77.85 only if co May 131.34 L, equat 8.81 dix L, eq	Jun 131.34 ion L9 or 7.44 uation L	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see 10.44 3a), also	Sep 131.34 Table 5 14.02 see Ta	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5	(annual) ₁ + (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65) (66) (67)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22	78.14 om water 80.41 om in calc ains (see Feb 131.34 6 (calculat 19.14 ains (calc 241.71	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Appendix 222.13	onth 0.2: 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	Oct 131.34 17.8 ble 5 196.06	+ (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies Jan (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains	78.14 om water 80.41 om in calc ains (see 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula	heating, 85.58 culation of the Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45	kWh/mc 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Append 222.13 ppendix	onth 0.23 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se	Sep 131.34 Table 5 14.02 See Table 182.74	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in A 36.13	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.2: 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32	Jun 131.34 ion L9 of 7.44 uation L	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49	Sep 131.34 Table 5 14.02 see Ta	Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34	+ (59)m 89.03 munity h Dec 131.34]	(65) (66) (67)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies Metabolic gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13 Pumps and factorial from the same factorial from the same factorial from the same factorial from the same factorial factorial from the same factorial factori	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated ir 235.45 tted in A 36.13 (Table 5	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.23 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se	Sep 131.34 Table 5 14.02 See Table 182.74	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68) (69)
(64)m= 91.66 Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in A 36.13	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13	onth 0.23 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat	Jun 131.34 ion L9 or 189.52 ion L15	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se	Sep 131.34 Table 5 14.02 See Table 182.74	ater heate x [(46)m 81.1 vater is fr Oct 131.34 17.8 ble 5 196.06	(annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies Metabolic gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13 Pumps and factorial from the same factorial from the same factorial from the same factorial from the same factorial factorial from the same factorial factori	78.14 om water 80.41 om in calc ains (see ns (Table 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ans gains 0	heating, 85.58 culation of the Table 5 5), Wate Mar 131.34 ted in Apr 15.56 ulated in 235.45 tted in Apr 36.13 (Table 5	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 0 tive valu	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 See Ta 182.74 ee Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies Jan (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (68)m= 239.22 Cooking gains (69)m= 36.13 Pumps and factorion (70)m= 0	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 6 (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ans gains 0 vaporatio	heating, 85.58 culation of Table 5 5), Wat Mar 131.34 ted in Ap 15.56 ulated in 235.45 tted in Ap 36.13 (Table 5	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 a Appendix 222.13 opendix 36.13	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the of Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 lso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 See Ta 182.74 ee Table 36.13	A column	(annual), + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15]	(65) (66) (67) (68) (69)
Heat gains from (65)m= 90.68 include (57) 5. Internal gains (66)m= 131.34 Lighting gains (67)m= 21.55 Appliances gains (69)m= 36.13 Pumps and factorion (70)m= 0 Losses e.g. e	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ns gains 0 vaporatio -105.07	heating, 85.58 culation of Table 5 5), Wate Mar 131.34 ted in Ap 15.56 ulated in 235.45 ated in A 36.13 (Table 5 on (negative)	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 0 tive valu	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)
Heat gains from (65)m= 90.68 include (57) 5. Internal gradies	78.14 om water 80.41 om in calc ains (see ns (Table Feb 131.34 s (calcula 19.14 ains (calc 241.71 s (calcula 36.13 ns gains 0 vaporatio -105.07	heating, 85.58 culation of Table 5 5), Wate Mar 131.34 ted in Ap 15.56 ulated in 235.45 ated in A 36.13 (Table 5 on (negative)	kWh/mo 78.28 of (65)m 5 and 5a ts Apr 131.34 opendix 11.78 n Append 222.13 opendix 36.13 5a) 0 tive valu	onth 0.25 77.85 only if co): May 131.34 L, equat 8.81 dix L, eq 205.32 L, equat 36.13 0 es) (Tab	Jun 131.34 ion L9 or 7.44 uation L 189.52 ion L15 36.13	× (45)m 69.92 s in the o Jul 131.34 r L9a), a 8.03 13 or L1 178.97 or L15a 36.13	Outp + (61)m 74.59 dwelling Aug 131.34 Iso see 10.44 3a), also 176.49), also se 36.13	Sep 131.34 Table 5 14.02 see Ta 182.74 ee Table 36.13	Oct 131.34 17.8 ble 5 196.06 2.5 36.13 0	r (annual) ₁ + (57)m 83.78 rom com Nov 131.34 20.77 212.87	+ (59)m 89.03 munity h Dec 131.34 22.15 228.67]	(65) (66) (67) (68) (69) (70)

Total internal	gains =	ı			(66	s)m + (67)m	ı + (68	8)m +	· (69)m + (70)m +	(71)m + (72)	m		
(73)m= 445.06	442.9	428.44	405.04	381.17	358.24	343.39	349.	.59	361.64	385.26	412.41	432.88		(73)
6. Solar gains	:													
Solar gains are ca	alculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions t	to co	nvert to the	e applica	able orientat	ion.		
Orientation: A			Area		Flu			_	g_ = b.l.= Cb		FF		Gains	
_	able 6d		m²			ble 6a			able 6b		Table 6c		(W)	
Southeast _{0.9x}	0.77	X	8.	19	x	36.79	X		0.63	X	0.7	=	92.09	(77)
Southeast _{0.9x}	0.77	X	8.	19	x	62.67	X		0.63	x	0.7	=	156.87	(77)
Southeast 0.9x	0.77	X	8.	19	x	85.75	X		0.63	x	0.7	=	214.64	(77)
Southeast 0.9x	0.77	X	8.1	19	X	106.25	X		0.63	_ x	0.7	=	265.94	(77)
Southeast 0.9x	0.77	X	8.	19	X _	119.01	X		0.63	x	0.7	=	297.88	(77)
Southeast 0.9x	0.77	X	8.1	19	X	118.15	X		0.63	×	0.7	=	295.73	(77)
Southeast 0.9x	0.77	X	8.1	19	X	113.91	X		0.63	x	0.7	=	285.11	(77)
Southeast 0.9x	0.77	X	8.1	19	X	104.39	X		0.63	×	0.7	=	261.29	(77)
Southeast 0.9x	0.77	X	8.1	19	X	92.85	X		0.63	X	0.7	=	232.41	(77)
Southeast 0.9x	0.77	X	8.1	19	x	69.27	X		0.63	x	0.7	=	173.37	(77)
Southeast 0.9x	0.77	X	8.	19	X	44.07	X		0.63	x	0.7	=	110.31	(77)
Southeast 0.9x	0.77	X	8.	19	x	31.49	X		0.63	x	0.7	=	78.81	(77)
Southwest _{0.9x}	0.77	X	3.0	55	x	36.79			0.63	x	0.7	=	6.18	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	62.67			0.63	x	0.7	=	10.53	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	85.75			0.63	X	0.7	=	14.41	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X _	106.25			0.63	X	0.7	=	17.86	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	119.01			0.63	x	0.7	=	20	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	118.15			0.63	x	0.7	=	19.86	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	113.91			0.63	x	0.7	=	19.15	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	104.39			0.63	x	0.7	=	17.55	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	92.85			0.63	x	0.7	=	15.61	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	69.27			0.63	x	0.7	=	11.64	(79)
Southwest _{0.9x}	0.77	X	0.5	55	X	44.07			0.63	x	0.7	=	7.41	(79)
Southwest _{0.9x}	0.77	X	0.5	55	x	31.49			0.63	x	0.7	=	5.29	(79)
Northwest _{0.9x}	0.77	X	7.5	55	x	11.28	X		0.63	X	0.7	=	26.03	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	22.97	X		0.63	x	0.7	=	52.99	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	41.38	X		0.63	x	0.7	=	95.48	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	67.96	X		0.63	X	0.7	=	156.8	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	91.35	X		0.63	x	0.7	=	210.77	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	97.38	X		0.63	x	0.7	=	224.7	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	91.1	X		0.63	x	0.7	=	210.2	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	72.63	X		0.63	x	0.7	=	167.58	(81)
Northwest _{0.9x}	0.77	X	7.5	55	x	50.42	X		0.63	x	0.7	=	116.34	(81)
Northwest _{0.9x}	0.77	X	7.5	55	X	28.07	X		0.63	X	0.7	=	64.76	(81)

Northwest 0.9x	0.77	X	7.5	55	x	14.2	x	0.63	x	0.7	=	32.76	(81)
Northwest 0.9x	0.77	X	7.5	55	x	9.21	x	0.63	×	0.7	=	21.26	(81)
Rooflights 0.9x	1	X	1.0)1	x	16.37	_ x [0.63	x	0.7		6.56	(82)
Rooflights 0.9x	1	X	1.0)1	x	33.68	x	0.63	x	0.7	=	13.5	(82)
Rooflights 0.9x	1	X	1.0)1	x	62.13	x [0.63	x	0.7	-	24.91	(82)
Rooflights 0.9x	1	x	1.0)1	x	104.87	×	0.63	x	0.7	=	42.04	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.66	x	0.63	x	0.7	=	57.59	(82)
Rooflights 0.9x	1	x	1.0)1	x	154.33	x	0.63	x	0.7	-	61.87	(82)
Rooflights 0.9x	1	x	1.0)1	x	143.9	×	0.63	x	0.7	=	57.69	(82)
Rooflights 0.9x	1	x	1.0)1	x	113.05	x	0.63	x	0.7	_	45.32	(82)
Rooflights 0.9x	1	X	1.0)1	x	76.56	×	0.63	x	0.7	_	30.69	(82)
Rooflights 0.9x	1	x	1.0)1	x	41.49	x	0.63	X	0.7	-	16.63	(82)
Rooflights 0.9x	1	X	1.0)1	x	20.65	×	0.63	x	0.7	_	8.28	(82)
Rooflights 0.9x	1	x	1.0)1	x	13.34	x	0.63	x	0.7	_	5.35	(82)
							_						
Solar gains ir	watts, ca	alculated	for eacl	h month			(83)m :	= Sum(74)m .	(82)m			-	
(83)m= 130.87		349.43	482.64	586.24	602.16		491.7	395.04	266.41	158.75	110.71		(83)
Total gains –	-		` ,	` ´ 	`	<u> </u>	1	_				1	
(84)m= 575.94	676.8	777.87	887.69	967.41	960.39	915.54	841.3	756.69	651.67	571.16	543.6		(84)
7. Mean inte	rnal temp	perature ((heating	season)								
Temperature	e during h	neating p	eriods ir	n the livi	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
								` ,					
Utilisation fa	ctor for g	ains for I	iving are	ea, h1,m	(see T	able 9a)	·	,					
Utilisation fa	ctor for g Feb	ains for I Mar	iving are Apr	ea, h1,m May	(see T Jun	able 9a) Jul	Au	<u> </u>	Oct	Nov	Dec		
					<u> </u>	1 	I .	g Sep	Oct 0.94	Nov 0.98	Dec 0.99		(86)
(86)m= 0.99	Feb 0.98	Mar 0.96	Apr 0.91	May 0.8	Jun 0.65	Jul 0.5	Au 0.56	g Sep 0.78		+			(86)
Jan	Feb 0.98	Mar 0.96	Apr 0.91	May 0.8	Jun 0.65	Jul 0.5	Au 0.56	g Sep 0.78		+			(86)
(86)m= 0.99 Mean internation (87)m= 21	Feb 0.98 al temper	Mar 0.96 rature in l	Apr 0.91 living are	0.8 ea T1 (fo	Jun 0.65 ollow ste	Jul 0.5 eps 3 to 7	Au 0.56 7 in Ta 21	g Sep 0.78 able 9c) 21	0.94	0.98	0.99		
Jan (86)m= 0.99 Mean interna	Feb 0.98 al temper	Mar 0.96 rature in l	Apr 0.91 living are	0.8 ea T1 (fo	Jun 0.65 ollow ste	Jul 0.5 eps 3 to 7	Au 0.56 7 in Ta 21	g Sep 0.78 able 9c) 21 Th2 (°C)	0.94	0.98	0.99		
(86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86	Feb 0.98 al temper 21 e during h 19.86	Mar 0.96 rature in l 21 neating p 19.86	Apr 0.91 living are 21 eriods ir 19.88	May 0.8 ea T1 (for 21 n rest of 19.88	Jun 0.65 ollow ste 21 dwellin 19.89	Jul 0.5 eps 3 to 7 21 g from Ta 19.89	Au 0.56 7 in Ta 21 able 9,	g Sep 0.78 able 9c) 21 Th2 (°C)	0.94	0.98	0.99		(87)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa	Feb 0.98 al temper 21 e during h 19.86 ctor for g	Mar 0.96 ature in 1 21 neating p 19.86 ains for r	Apr 0.91 living are 21 eriods ir 19.88	May 0.8 ea T1 (for 21 rest of 19.88 welling,	Jun 0.65 ollow ste 21 dwellin 19.89 h2,m (s	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 see Table	Au 0.56 7 in Ta 21 able 9, 19.9	g Sep 0.78 able 9c) 21 . Th2 (°C) 19.89	0.94 21 19.88	0.98 21 19.88	0.99		(87)
Jan 0.99	Feb 0.98 al temper 21 e during r 19.86 ctor for g 0.97	Mar 0.96 rature in 1 21 neating p 19.86 ains for r 0.95	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39	Au 0.567 in Ta 21 21 21 29 29 29 20 0.44	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89	0.94 21 19.88	0.98	0.99		(87)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper	Mar 0.96 eature in leating p 19.86 ains for r 0.95 eature in t	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelli	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 f	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table	0.94 21 19.88 0.92 e 9c)	0.98 21 19.88 0.97	0.99 21 19.87 0.99		(87) (88) (89)
Jan 0.99	Feb 0.98 al temper 21 e during r 19.86 ctor for g 0.97	Mar 0.96 rature in 1 21 neating p 19.86 ains for r 0.95	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39	Au 0.567 in Ta 21 21 21 29 29 29 20 0.44	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99		(87) (88) (89) (90)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper	Mar 0.96 eature in leating p 19.86 ains for r 0.95 eature in t	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelli	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 f	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99	0.27	(87) (88) (89)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86	Mar 0.96 ature in 1 21 neating p 19.86 ains for r 0.95 ature in 1 19.86	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88	May 0.8 ea T1 (for the second	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99	0.27	(87) (88) (89) (90)
Jan 0.99 Mean internal (87)m= 21 Temperature (88)m= 19.86 Utilisation far (89)m= 0.99 Mean internal (90)m= 19.86	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86	Mar 0.96 ature in 1 21 neating p 19.86 ains for r 0.95 ature in 1 19.86	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88	May 0.8 ea T1 (for the second	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction for the first separate of the first se	0.94 21 19.88 0.92 e 9c) 19.88	0.98 21 19.88 0.97	0.99 21 19.87 0.99	0.27	(87) (88) (89) (90)
Jan (86)m= 0.99 Mean internation (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internation (90)m= 19.86 Mean internation (92)m= 20.17 Apply adjust	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17	Mar 0.96 ature in 1 21 neating p 19.86 ains for r 0.95 ature in 1 19.86	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88 r the wh 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 ole dwe 20.19	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1 19.9 + (1 - 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 f -fLA) × T2 20.19	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi	0.98 21 19.88 0.97 19.88 ng area ÷ (4	0.99 21 19.87 0.99 19.87	0.27	(87) (88) (89) (90) (91) (92)
Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17	Mar 0.96 ature in 1 19.86 ains for r 0.95 ature in 1 19.86 ature (fo 20.17 he mean 20.17	Apr 0.91 living are 21 eriods ir 19.88 rest of de 0.88 the rest 19.88 r the wh 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 ole dwe 20.19	Jun 0.65 ollow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 1 19.9 + (1 - 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 f-fLA) × T2 20.19 where approximations	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi	0.98 21 19.88 0.97 19.88 ng area ÷ (4	0.99 21 19.87 0.99 19.87	0.27	(87) (88) (89) (90) (91)
Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating required	Mar 0.96 ature in langle partial par	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling, 19.88 cole dwe 20.19 temper 20.19	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 4 4 e, w 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates a proximate approximate approx	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18	0.99 21 19.87 0.99 19.87 1) =		(87) (88) (89) (90) (91) (92)
Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating required	Mar 0.96 ature in 1 19.86 ains for r 0.95 ature in 1 19.86 ature (fo 20.17 he mean 20.17 uirement ternal ternal ternal ternal	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 4 4 e, w 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates a proximate approximate approx	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18	0.99 21 19.87 0.99 19.87 1) =		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.99 Mean internative (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internative (90)m= 19.86 Mean internative (92)m= 20.17 Apply adjust (93)m= 20.17 8. Space he Set Ti to the the utilisation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating required factor for g	Mar 0.96 ature in langer of the mean ature (for 20.17) ature in the mean ature or gains to regains to respect to the mean ature at the mean ature or gains to regains to regains to respect to the mean ature at the mean a	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18 mperaturusing Ta	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain able 9a	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2 tep 11 of	Au 0.56 7 in Ta able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 Table	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approxes 20.19	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18 20.18	0.99 21 19.87 0.99 19.87 20.18 20.18		(87) (88) (89) (90) (91) (92)
Mean internations (86)m= 0.99 Mean internations (87)m= 21 Temperature (88)m= 19.86 Utilisation far (89)m= 0.99 Mean internations (90)m= 19.86 Mean internations (92)m= 20.17 Apply adjust (93)m= 20.17 8. Space he Set Ti to the the utilisation Jan	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating requires require factor for g	Mar 0.96 ature in l 19.86 ains for r 0.95 ature in t 19.86 ature (fo 20.17 he mean 20.17 uirement ternal ter or gains to Mar	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18 mperaturusing Ta	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2	Au 0.56 7 in Ta 21 able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 4 4 e, w 20.2	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 f -fLA) × T2 20.19 where approx 2 20.19	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18	0.99 21 19.87 0.99 19.87 1) =		(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.99 Mean internative (87)m= 21 Temperature (88)m= 19.86 Utilisation fa (89)m= 0.99 Mean internative (90)m= 19.86 Mean internative (92)m= 20.17 Apply adjust (93)m= 20.17 8. Space he Set Ti to the the utilisation	Feb 0.98 al temper 21 e during h 19.86 ctor for g 0.97 al temper 19.86 al temper 20.17 ment to t 20.17 ating requires require factor for g	Mar 0.96 ature in l 19.86 ains for r 0.95 ature in t 19.86 ature (fo 20.17 he mean 20.17 uirement ternal ter or gains to Mar	Apr 0.91 living are 21 eriods ir 19.88 rest of do 0.88 the rest 19.88 r the wh 20.18 internal 20.18 mperaturusing Ta	May 0.8 ea T1 (for 21 n rest of 19.88 welling, 0.75 of dwelling 19.88 cole dwe 20.19 temper 20.19 re obtain able 9a	Jun 0.65 bllow str 21 dwellin 19.89 h2,m (s 0.56 ng T2 (19.89 lling) = 20.2 ature fr 20.2	Jul 0.5 eps 3 to 7 21 g from Ta 19.89 eee Table 0.39 follow ste 19.89 fLA × T1 20.2 om Table 20.2 tep 11 of	Au 0.56 7 in Ta able 9, 19.9 9a) 0.44 eps 3 t 19.9 + (1 - 20.2 Table	g Sep 0.78 able 9c) 21 Th2 (°C) 19.89 0.71 to 7 in Table 19.89 fraction 7 in Table 20.19 where approximates 20.19 g Sep Sep	0.94 21 19.88 0.92 e 9c) 19.88 LA = Livi 20.19 ppriate 20.19	0.98 21 19.88 0.97 19.88 ng area ÷ (4 20.18 20.18	0.99 21 19.87 0.99 19.87 20.18 20.18		(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m	(O=)
(95)m= 567.93 660.01 739.63 789.82 744.33 564.99 386.41 400.99 554.25 600.53 557.48 537.35	(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]	(00)
(97)m= 1825.6 1751.59 1563.73 1272.59 954.52 621.62 399.42 420.86 680.03 1078.25 1479.32 1816.79	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	, ,
(98)m= 935.71 733.54 613.13 347.59 156.38 0 0 0 0 355.43 663.73 951.9	
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =	4757.41 (98)
Space heating requirement in kWh/m²/year	52.81 (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	257.28 (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)	KVVIII yCai
935.71 733.54 613.13 347.59 156.38 0 0 0 0 355.43 663.73 951.9	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
363.7 285.12 238.31 135.11 60.78 0 0 0 138.15 257.98 369.99	(= : : /
Total (kWh/year) =Sum(211) _{15,1012} =	1849.15 (211)
Space heating fuel (secondary), kWh/month	
= {[(98)m x (201)] } x 100 ÷ (208)	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) =Sum(215) _{15,10,12} =	0 (215)
Water heating	
Output from water heater (calculated above)	
91.66 78.14 87.28 77.81 96.56 145.78 140 153.68 153.41 82.23 83.91 88.31	
Efficiency of water heater	188.96 (216)
(217)m= 188.96 188.	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	
(219)m= 48.51 41.35 46.19 41.18 51.1 77.15 74.09 81.33 81.19 43.52 44.41 46.74	
Total = Sum(219a) ₁₁₂ =	676.76 (219)
Annual totals kWh/year	kWh/year
Space heating fuel used, main system 1	1849.15
Water heating fuel used	676.76
Electricity for pumps, fans and electric keep-hot	
Total electricity for the above, kWh/year sum of (230a)(230g) =	0 (231)

Electricity for lighting (232)380.53 (233) Electricity generated by PVs -1086.82 Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 1819.62 (338)12a. CO2 emissions – Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) 0.519 959.71 (261)Space heating (secondary) (215) x (263)0.519 0 Water heating (219) x (264)0.519 351.24 (261) + (262) + (263) + (264) =Space and water heating 1310.95 (265)(231) x Electricity for pumps, fans and electric keep-hot (267)0.519 0 (232) x Electricity for lighting 0.519 197.49 (268)Energy saving/generation technologies Item 1 (269)0.519 -564.06 sum of (265)...(271) = Total CO2, kg/year 944.38 (272) $(272) \div (4) =$ **Dwelling CO2 Emission Rate** 10.48 (273)

El rating (section 14)

(274)

91



Appendix D

SAP10

GLA SAP10 Conversions Spreadsheet

The applicant shou	uld comple	lete all the l	light blue o	cells including i	nformation on the	modelled units, the	area per unit, the	number of units, the	baseline energy con	sumption figures,	the TER and the TF	EE.				SAP 2012 CO2	PERFORMANCE					S	SAP10 CO2 PERFO	RMANCE			
DOMESTIC EN	NERGY	CONSUI	MPTION	AND CO2	ANALYSIS																						DEMAND
					VALIDAT	TION CHECK		REGULATE	D ENERGY CONSUM	PTION PER UNIT (I	kWh p.a.) - TER WO	RKSHEET			REGU	LATED CO2 EMISSI	ONS PER UNIT (kgC	O2 p.a.)				REGUL	ATED CO2 EMISSI	ONS PER UNIT			Fabric Energy Efficiency (FEE
Unit identifier e.g. plot number, dwelling type etc.)	Model t floor a (m²)	area 140	ımber of units	Total area represented by model (m²)	Calculated TER 2012 (kgCO2 / m2)	TER Worksheet TER 2012 (kgCO2 / m2)	Space Heating	Fuel type Space Heating	Domestic Hot Water	Fuel type Domestic Hot Water	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Cooling	2012 CO2 emissions (kgCO2 p.a.)	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Cooling	SAP10 CO2 emissions (kgCO2 p.a.)	Calculated TER SAP10 (kgCO2 / m2)	Target Fabric Energy Efficienc (TFEE) (kWh/m
	TER Worksh (Row	heet				TER Worksheet (Row 273)	TER Worksheet (Row 211)		TER Worksheet (Row 219)		TER Worksheet (Row 232)	TER Worksheet (Row 231)	N/A														
Sample 1 Sample 2 Sample 3	90.08 90.08 90.08	18	1 1 1	90.08 90.08 90.08	18.6 17.6 18.6	18.6 17.6 18.6	4213.92 3790.87 4213.92	Natural Gas Natural Gas Natural Gas	2459.72 2465.27 2459.72	Natural Gas Natural Gas Natural Gas	380.53 380.53 380.53	75 75 75		910 819 910	531 532 531	197 197 197	39 39 39		1,678 1,588 1,678	885 796 885	517 518 517	89 89 89	17 17 17		1,508 1,420 1,508	16.7 15.8 16.7	
um	270		3	270	18.3	-	12,219	N/A	7,385	N/A	1,142	225	0	2,639	1,595	592	117	0	4,944	2,566	1,551	266	52	0	4,435	16.4	0.00
NON-DOMES	IIC ENI	EKGY CC	JNSUMI	PHON AND	CO2 ANALYS																						
Building Use	Area per (m²)	runit Nu ')	ımber of units	Total area represented by model (m²)	Calculated TER 2012	BRUKL TER 2012	Space Heating	Fuel type Space Heating	Domestic Hot Water		Lighting	Auxiliary	Cooling	Natural Gas		V BY FOEL TYPE (K	wn/m p.a., rek - s	SOURCE: BRUKE.IF	2012 CO2 emissions (kgCO2 p.a.)		Grid Electricity	PHON BY FOEL	TPE (KWN/M* p.a	.j - IER BRUKL	SAP10 CO2 emissions	BRUKL TER SAP10	
				···· /	(kgCO2 / m2)	(kgCO2 / m2)								***************************************	***************************************				(ngcoz piu.)	***************************************	***************************************				(kgCO2 p.a.)	(kgCO2 / m2)	

Sum	0 0	0	-	0	0	0	0	0	0	0	0	0	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	#DIV/0!
SITE-WIDE E	NERGY CONSUMPTION ANI	CO ₂ ANALYSIS																					
		Calculated]		REGULATE	D ENERGY CONSUM	MPTION								REGULATED CO2 EMISSIONS						REGULATED CO2	EMISSIONS PER UNIT
Use	Total Area (m²)	TER 2012 (kgCO2 / m2)	-	Space Heating (kWh p.a.)	H _P	Domestic Hot Water (kWh p.a.)	_H la	Lighting (kWh p.a.)	Auxiliary (kWh p.a.)	Cooling (kWh p.a.)						2012 CO2 emissions (kgCO2 p.a.)						SAP10 CO2 emissions (kgCO2 p.a.)	Calculated TER SAP10 (kgCO2 / m2)
Sum	270	18.3	-	12,219		7,385		1,142	225	0						4,944						4,435	16.4

applicant should comp	plete all the light b	lue cells including i	information on the	be lean' energy c	onsumption figures,	, the 'be lean' DER, th	he DFEE and the reg	gulated energy dem	and of the 'be lean'	scenario.				SAP 2012 CO2 P	PERFORMANCE					SA	AP10 CO2 PERFORM	MANCE							
MESTIC ENERGY	CONSUMPTI	ON AND CO2	ANALYSIS																							DON	MESTIC ENERG	GY DEMAND DAT	TA
it identifier		Total area		ION CHECK		REGULATED ENER								ATED CO2 EMISSIO							TED CO2 EMISSION				Fabric Energy Efficiency (FEI	E) KEGI		DEMAND PER UNIT PER	
it identifier Model le.g. plot floor a ber, dwelling (m ² ype etc.)	I total Number of area units (2)	of represented by model (m²)	Calculated DER 2012 (kgCO2 / m2)	DER Worksheet DER 2012 (kgCO2 / m2)	Space Heating	Fuel type Space Heating	Domestic Hot Water	Fuel type Domestic Hot Water	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Lighting	Auxillary	Cooling	2012 CO2 emissions (kgCO2 p.a.)	Space Heating CO2 emissions (kgCO2 p.a.)	Domestic Hot Water CO2 emissions	Lighting CO2 emissions (kgCO2 p.a.)	Auxiliary CO2 emissions (kgCO2 p.a.)	Cooling CO2 emissions (kgCO2 p.a.)	SAP10 CO2 emissions (kgCO2 p.a.)	Calculated DER SAP10 (kgCO2 / m2)	Dwelling Fabr Energy Efficien (DFEE) (kWh/n	ic Space Heating icy (kWh p.a.) n ²)	Domestic Hot Water (kWh p.a.)	Lighting (kWh p.a.)	Auxiliary (kWh p.a.)
				DER Sheet (Row 384)	DER Sheet ((Row 307a) +	Select fuel type	DER Sheet ((Row 310a) +	Select fuel type	DER Sheet Row 332	DER Sheet (Row 313 + 331)	DER Sheet Row 315								(kgCO2 p.a.)							+			
ole 1 90.0	08 1	90.08	16.5	16.5	(Row 367a x 0.01)) 4253.43	Natural Gas	(Row 367a x 0.01)] 1547.35	Natural Gas	380.53	75	0	919	334	197	39	0	1,489	893	325	89	17	0	1,324	14.7					
ile 2 90.0	08 I 08 I	90.08 90.08	15.6 16.5	15.6 16.5	3852.94 4253.43	Natural Gas Natural Gas	1566.44 1547.35	Natural Gas Natural Gas	380.53 380.53	75 75	0	832 919	334 338 334	197 197 197	39 39	0	1,407 1,489	809 893	329 325	89 89	17 17	0	1,244 1,324	13.8 14.7					
		270			12,360	N/A	4,661	N/A	1,142	225	0	2,670	1,007	592	117	0	4,386	2,596	979	266	52	0	3,893	14.4	0.00	0	0	0	0
OMESTIC EN	NERGY CONSU	IMPTION AND		ION CHECK	REGI	ULATED ENERGY CON	NSUMPTION BY EN	D USE (kWh/m² p.a.) 'BE LEAN' BER - SC	OURCE: BRUKL OUT	PUT	JLATED ENERGY CO	INSUMPTION BY F	UEL TYPE (kWh/m²	o.a.) 'BE LEAN' BE	R - SOURCE: BRU	KL.INP or *SIM.CSV	Į.		REGULA	TED CO2 EMISSION	NS PER LINIT				_		ENERGY DEMAN	
g Use Area pe	erunit Numbero ²) units	Total area of represented by model	Calculated BER 2012	BRUKL BER 2012								Natural Gas		OLL TITE (KWII) III	pas, occasion	n - Jounes, and	2012 CO2 emissions		Grid Electricity	REGULA	TIED COZ EMISSIOI	NS PER UNIT	SAP10 CO2 emissions	BRUKL BER SAP10		Space Heating			Auxiliary
		(m²)	BER 2012 (kgCO2 / m2)	BER 2012 (kgCO2 / m2)	(kWh/m² p.a.)	Fuel type Space Heating	(kWh/m² p.a.)	Domestic Hot Water	(kWh/m² p.a.)	(kWh/m² p.a.)	(kWh/m² p.a.)	**************************************					(kgCO2 p.a.)	***************************************	BEARER STREET				(kgCO2 p.a.)	BER SAP10 (kgCO2 / m2)		(kWh p.a.)	Domestic Hot Water (kWh p.a.)	(kWh p.a.)	(kWh p.a.)
																									NA				
		ON AND CO2			0	N/A	0	N/A	0	0	0	0	0	N/A	N/A	N/A	0	0	0				0	#DIV/0!		0	0	0	0
			Calculated				REGULAT	ED ENERGY CONSUL	MPTION								REGULATED CO2 EMISSIONS						REGULATED	CO2 EMISSIONS		REG	SULATED ENERGY D	DEMAND PER UNIT PER	R ANNUM (kWh p
.		(m²)	BER 2012		1		Domestic Hot		Lighting	A	Cooling						2012 CO2						SAP10 CO2	Calculated		Space Heating	Domestic Hot	Lighting	Auxiliary
	Total Area	,	(kgCO2 / m2)		Space Heating		Water			(loub = -)	Cooming .						emissions						emissions	BER SAP10	Alk	Space meaning		(lattle = =)	flours 1
	1 otal Area		(kgCO2 / m2)		Space Heating (kWh p.a.)	41/2	Water (kWh p.a.) 4,661	41 ^p	(kWh p.a.)	Auxiliary (kWh p.a.) 225	(kWh p.a.)						emissions (kgCO2 p.a.) 4,386						emissions (kgCO2 p.a.) 3,893	BER SAP10 (kgCO2 / m2)	HIL	(kWh p.a.)	(kWh p.a.)	(kWh p.a.)	Auxiliary (kWh p.a.)

		the light blue cells includ		se 'be green' energy :	consumption figures	and the 'be green' Di	ER.															SAP 2012 CO2 PERFOR	MANCE						SA	P10 CO2 PERFORMA	NICE			
DOMESTIC	ENERGY CONS	ISUMPTION AND (_	ATION CHECK	1					RECULATED ENERG	GY CONSUMPTION PER	LINET GARGO CO. 1	DE COSEN' SAN DER W	OBSTRUCT							PROTECTION	TED COZ EMISSIONS PER	UNIT (become a)						escu.	TED COZ EMISSIONS	MA UNIT			
Unit identifie (e.g. plot numb	Model total er, floor area	Total as Number of represer		DER Workshaue	it Space Heating	fuel type	Domestic Hot Water (Heat Source 1)	Fuel type	Space Heating					6 - I	Total Electricity	Electricity	Lighting Aux	ary Cooling	Space Heating C	Iomestic Hot Spa	ace Heating Electr	city Electricity	Lighting	Auxiliary 0	ooling 2012 CO2	Space Heating	Domestic Hot S	pace Heating	Electricity Elect	ricity Lightin		Cooling S	AP10 CO2	Calculated DER SAP10
dwelling type etc.)	(m²)	Number of represer units by mod (m²)	(kgCO2 / m2)	DER 2012 (kgCO2 / m2)	(Heat Source 1)	Space Heating	(Heat Source 1)	Domestic Hot Water	(Heat source 2)	Space Heating	(Heat source 2)		Water from CHP		generated by CHP (-							ed by generated by renewable			emissions (kgCO2 p.a.		Water a		enerated by general CHP rener			04	emissions (k gCO2 p.a.) (k	gCO2 / m2)
				DER Sheet (Row 384)	DER Sheet (Row 307b + (Row 367b x	Select fuel type	DER Sheet [Row 310b + (Row 367b x 0.01)]	Select fuel type	if applicable DER Sheet (Row 307c + (Row 367c x	Select fuel type	If applicable DER Sheet [Row 310c + [Row 367c x 0.01]]	Select fuel type	if applicable DER Sheet ((Row 307a + 310a)	if applicable Select fuel type	if applicable DER Sheet [(Row 307a + 310a) × (Row 361 + 362)]	if applicable DER Sheet D Row 380	DER Sheet DER Row 332 (Row 33	neet DER Sheet + 331) Row 315		•	applicable if appli	cable if applicable						if applicable i	f applicable if app	icable				
		1 90.00			(Row 367b x 0.01)] 1849.15	Grid Flertninity	(Row 367b x 0.01)]			Grid Electricity	(Row 367c x 0.01)]		(Row 362 x 0.01)]		× (Row 361 + 362)]		380 53																	
Sample 1 Sample 2	90.08 90.08	1 90.00 1 90.00 1 90.00	10.5 10.1 10.5	10.5 10.1 10.5	1849.15 1777.1 1849.15	Grid Electricity Grid Electricity Grid Electricity	676.76 686.56 676.76	Grid Electricity Grid Electricity Grid Electricity	1	Grid Electricity Grid Electricity Grid Electricity		Grid Electricity Grid Electricity Grid Electricity				-1086.82	380.53 380.53 380.53		960 922 960	351 356 351		-564 -564 -564	197 197 197		964 912 944	431 414 431	158 160 158		-2	53 89 53 89			424 409 424	4.7 4.5 4.7
sample s	90.08	1 90.00	10.5	10.5	1849.15	Gno Electricity	676.76	Grid Electricity		Gno Electricity		una Electricity				-1080-82	380.53		960	351		-554	197			431	158		**				424	•
Sum																																		
111	270	3 270	10.4	-	5,475	N/A	2,040	N/A	0	N/A	0	N/A	0	N/A		-3,260	1,142		2,842	1,059	0 0	-1,692	592	0	0 2,801	1,276	475	0	0 -3	60 266	6 0	0	1,257	4.7
NON-DOM		3 270 Y CONSUMPTION	AND CO2 ANAL	YSIS	5,475	N/A	2,040	N/A							0	-3,260	1,142	٥								1,276	475	0				0	1,257	4.7
NON-DOM	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK		fuel type	Domestic Hot Water	Fuel type			0 ISUMPTION BY END US				Flortricity	Flortricity	1,142 Lighting Aux	0 ary Cooling			CONSUMPTION BY FU	ELTYPE (kWh/m² p.a.) 1	SE GREEN' BER - SOL	JRCE: BRUIKLINP or *SIM	CSV FILE	Natural Gas	475 Grid Electricity	0 Bespoke DH	REGULA Electricity Elect	TED CO2 EMISSIONS	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL
NON-DOM	ESTIC ENERGY		AND CO2 ANAL VAUD	YSIS	Space Heating		Domestic Hot Water								Flortricity	Flortricity	1,142 Lighting Aux	0 ary Cooling			CONSUMPTION BY FU	ELTYPE (kWh/m² p.a.) 1	SE GREEN' BER - SOL	JRCE: BRUIKLINP or *SIM	CSV FILE r Carbon 2012 CO2	Natural Gas	475 Grid Electricity	0 Bespoke DH Factor #	REGULA Electricity Elect	TED CO2 EMISSIONS	PER UNIT	Enter Carbon S	AP10 CO2	4.7 BRUKL BER SAP10 ugCO2 / m2)
NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type							Electricity generated by CHP (-)	Flortricity	1,142	O Cooling				ELTYPE (kWh/m² p.a.) 1	SE GREEN' BER -SOL	JRCE: BRUIKLINP or *SIM	CSV FILE	Natural Gas	475 Grid Electricity	Bespoke DH Factor g	REGULA Electricity Elect	TED CO2 EMISSIONS : ricity Waste Hear ted by Power Str vable cology .)	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
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NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type							Electricity generated by CHP (-)	Flortricity	1,142	O Cooling	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity ed by generated by rensemble technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Grid Electricity	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type							Electricity generated by CHP (-)	Flortricity	1,142	o o o o o o o o o o o o o o o o o o o	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity ed by generated by rensemble technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Gold Electricity	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type							Electricity generated by CHP (-)	Flortricity	1,142	0 arry Cooling	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity generated by renewable technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Grid Electricity	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
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NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type	REGU	LATED ENERGY COM	SUMPTION BY END US	56 (kWh/m² p.a.) '86	GREEN' BER - SOURCE	E: BRUIS. GUTPUT	Electricity generated by CHP (-)	Flortricity	3,542 Lighting Aust	O Cooling	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity generated by renewable technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Grid Electricity BANKARARAMANIAN A	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
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NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type	REGU	LATED ENERGY COM	SUMPTION BY END US	56 (kWh/m² p.a.) '86	GREEN' BER - SOURCE	E: BRUIS. GUTPUT	Electricity generated by CHP (-)	Flortricity	1,142	O Coding	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity generated by renewable technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Gold Electricity BRANCHEROMORPHISM	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type	REGU	LATED ENERGY COM	SUMPTION BY END US	56 (kWh/m² p.a.) '86	GREEN' BER - SOURCE	E: BRUIS. GUTPUT	Electricity generated by CHP (-)	Flortricity	1,142	o ary Cooling	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity generated by renewable technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Gold Electricity	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
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NON-DOM Use	ESTIC ENERGY	Y CONSUMPTION	AND CO2 ANAL VAUD	YSIS ATION CHECK BRUKL BER 2012	Space Heating	fuel type	Domestic Hot Water	Fuel type	REGU	LATED ENERGY COM	SUMPTION BY END US	56 (kWh/m² p.a.) '86	GREEN' BER - SOURCE	E: BRUIS. GUTPUT	Electricity generated by CHP (-)	Flortricity	1,142	0 Cooling	Natural Gas G	REGULATED ENERGY rid Electricity Bu	r CONSUMPTION BY FU espoke DH Electr Factor general CH (-)	city Electricity generated by renewable technology (-) coble if applicable	SE GREEN' BER - SOL Waste Heat From Power Station	JRCE: BRUKLINP or *SIM Enter Carbon Ent Factor 2 F	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	475 Grid Electricity - AMERICAN STATE OF THE STATE OF TH	Bespoke DH Factor g	Electricity Elect enerated by generated by reme (-) teche (-) gapticable if app	ricity Waste Hear ted by Power Str vable ology) icable	PER UNIT	Enter Carbon S	AP10 CO2	BRUKL BER SAP10
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NON-DOM Use	Area per unit (m²)	Total in Number of Personal Vision of Personal Vision Visi	MAND CO2 ANAL MALO MAND MAND MAND MAND MAND MAND MAND MAND	YSIS BRUKE, BRI 2012 PigCO2 / m2)	Space Meeting	Fruif type Space Heating	Conneck Rel Water	Full type Domestic Not Water	REGU	LATED ENERGY COM	SUMPTION BY END US	56 (kWh/m² p.a.) 186	GREEN' BER - SOURCE	E: BRUIS. GUTPUT	Clectricity generated by Cib (3) If applicable	Electricity generated specific production of the control of the co	Lighting Aus	ery Cooling	Methoral Gas G	HEGULATED ENERGY	CONSUMPTION BY FULL PROPERTY OF THE PROPERTY O	ILITYE (NOW), or p.a.) view of the second of	ME CREEN BER - SOO	MICE SELVEL UP OF **SELVEL UP OF **S	COV PILE GENERAL GE	Natural Gas	Grid Electricity	Baspoke OH Factor g	MEGULATION Electricity Clectricity generated by genera	TED COZ E MISSIONS Water from the first of	PEUNT Cabus	Enter Carbon 5 Factor 3 -	AP10 CC2 Infrastructure (AP10 CC2)	BRUIKL BER 1AP10 gCO2 / m2)
Use Sum	Area per unit	Todal or representation of the control of the contr	WALES COS ANAL WALES CONTINUE TO THE CONTINUE	YSIS ATON CHECK SHUKE, SH 2022 (9gC02 / m2)	Space Meeting	fuel type	Conneck Rel Water	Fuel type	REGU	LATED ENERGY COM	SUMPTION BY END US	56 (kWh/m² p.a.) 186	GREEN' BER - SOURCE	E: BRUIS. GUTPUT	Electricity generated by CHP (-)	Electricity generated specific production of the control of the co	Lighting Aus	O Couling	Methoral Gas G	HEGULATED ENERGY	CONSUMPTION BY FULL PROPERTY OF THE PROPERTY O	ILITYE (NOW), or p.a.) view of the second of	ME CREEN BER - SOO	MICE SELVEL UP OF **SELVEL UP OF **S	cSV FILE or Carbon 2012 CO2 ector 3 emissions (bgCO2 p.a.	Natural Gas	Grid Electricity	Baspoke OH Factor g	MEGULATION Electricity Clectricity generated by genera	TED COZ E MISSIONS Water from the first of	PER UNIT	Enter Carbon 5 Factor 3 -	AP10 CC2 Infrastructure (AP10 CC2)	BRUIKL BER 1AP10 gCO2 / m2)
Use Sum	Area per unit	Total in Number of Personal Vision of Personal Vision Visi	WALES COS ANAL WALES CONTINUE TO THE CONTINUE	YSIS ATON CHECK SHUKE, SH 2022 (9gC02 / m2)	Space Meeting	Fruif type Space Heating	Conneck Rel Water	Full type Domestic Not Water	REGU	LATED ENERGY COM	SUMPTION OF ERE US	56 (kWh/m² p.a.) 186	GREEN BER - SOURCE	E: BRUIS. GUTPUT	Clectricity generated by Cib (3) If applicable	Electricity generated specific production of the control of the co	Lighting Aus	ery Cooling	Methoral Gas G	REGULATED ENERGY BASES REGERENCE AND THE STATE OF THE S	CONSUMPTION BY FULL PROPERTY OF THE PROPERTY O	ILITYE (NOW), or p.a.) view of the second of	ME CREEN BER - SOO	MICE SELVEL UP OF **SELVEL UP OF **S	COV PILE GENERAL GE	Natural Gas	Grid Electricity	Baspoke OH Factor g	Begünzier Geschicht Geschi	TED COZ E MISSIONS Water from the first of	IPRUMPT Inframe Enter Curban Inframe Enter Curban Inframe Infr	Enter Carbon 5 Factor 3 -	AP10 CC2 Infrastructure (AP10 CC2)	BRUIKL BER 1AP10 gCO2 / m2)
Sum SITE-WIDE	Area per usit (ser)	Y CONSUMPTION Number of representation of repre	VALID VA	YSIS BRUSE BRUSE BRI SEE (MCCC2 / m2)	Space Meeting	Fruif type Space Heating	Conneck Rel Water	Full type Domestic Not Water	REGU	LATED ENERGY COM	REGULAT	50 (0000/m² p.m.) "80	GREEN BER - SOURCE	E: BRUIS. GUTPUT	Electristy generately CIP () If applicable	Electricity provincials	Lighting Aus	ery Cooling	Natural Gas G	REGULATED ENERGY BU	CONSUMPTION BY I'LL STATE OF TABLE S	ILITYE (DOWN/or p.a.) volvy Charlesty of by General by Charlesty C	or CREEN BER - SOO Waste Need From Power Station a separagraphical control of the Station O	PRICE SBURKLING OF *SENSE Enter Carbon Co. Pacific 2 Process P	COMPILE FEMON SIZE COS FEMON	Natural Gas	Grid Electricity ENERGENEERING 1	Daspoka DH Factor g	Begulation of the control of the con	TEO CO2 E MISSIONS Water Name Proved St O O O O O O O O O O O O O	IFRUINT After the fore Corbu- fretor Febru 2 ***********************************	Enter Carbon 5 Factor 3 1	AP30 CO2 Initiations I	BRUST. BRIESHAMD GCGCZ / m2)
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Sum.	Area per usit (ser)	Y CONSUMPTION Number of representation of repre	AND COS ANAL WALLD	YSIS SILVE SIN	Space Meeting	Fruif type Space Heating	Comestic Not Water	Full type Domestic Not Water	REGU	LATED ENERGY COM	REGULAT	50 (0000/m² p.m.) "80	GREEN BER - SOURCE	E: BRUIS. GUTPUT	Electricity generated by CP () If applicable	Electricity or the control of the co	Lighting Aus	ery Coding	Natural Gas G	ecolutated exector and Eberrary and Eberra	CONSUMPTION BYTU	ti TYPE (WWh/m* p.a.) 1 dy Gentriky Franciscolar Transcolar Tr	of CREEN BIR SOO. Waste Stage From Proces Section 1 a secretary and a sec	ARCE BRUNE, NO or "SMITCHES COLOR TO SMITCHES CO	COM PILE 1 (Subsection)	Returni Gas	Grid Electricity BARRANGE AND A COLUMN TO THE COLUMN TO	Baspoke DH Factor 8 2 2 2 2 2 2 2 2 2 2 2 2 2	BEGULAN FLORING COLOR CO	TEO CO2 EMISSIONS Water New York Control of the Co	PREVIOUS Combined for the Combined for t	Enter Carbon 5 Factor 3 1	AP10 CO2	BRUSE BREASHID GCC02 / m2) solvytol



Appendix E

Part G

Internal Water Use Calculation

breglobal

Rainwater G	reywater Results
Issue Date:	
Development name:	119 East Road
Registration no:	STRO010583
Assessor name:	Neil Ingham
Date:	May-21
Job no:	21385

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS

(for use with the Code for Sustainable Homes issues Wat 1 for the May 2009 and subsequent versions)

Dwelling Description 119 East Road

1st step - Select from options below:

	Is a Rain and/or Greywater system specified?
Yes	Is a shower AND bath present?
	Has a washing machine been specified?
No.	Has a dishwasher been specified?

2nd step - Build spreadsheet (click button below)

BUILD SPREADSHEET

As soon as this button is pressed the spreadsheet will change according to the options selected previously in the 1st step. Scroll down to see the changes.

3rd step - Enter consumption details for the specified fittings

TAPS (excluding kitchen taps)		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Basins	4.00	2
	2			
	3			
	4			
		Proporti	ionate flow rate (litres/min)	2.80
		Consum	otion / person / day (Litres)	7.90

BATHS		Fitting type	Capacity to overflow (litres)	Number of fittings
	1	Bath	150.00	1
	2			
	3			
	4			
		Proportionate of	capacity to overflow (litres)	105.00
		Consum	otion / person / day (Litres)	16.50
SHOWERS		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Shower	8.00	1
	2			
	3			
	4			
			ionate flow rate (litres/min)	5.60
		Consum	ption / person / day (Litres)	34.96
DISHWASHER				
Where no dishwasher is specified, a default consumption figure of 1.25 litres per place setting is used.				
		Consum	ption / person / day (Litres)	4.50
WASHING MACHI	NES			Number of fittings
Where no washing machine is specified, a default consumption figure of 8.17 litres per kilogram of dry load is				

	used.				
V				ed but plumbing for future alled, please enter details:	
	-				
			Consum	otion / person / day (Litres)	17.16
WC's	Fitting Typ	pe	Flush Type	Volume**	Number of fittings
			Full Flush	5.00	
1	Toilet		Part Flush	3.00	2
			Full Flush		
2			Part Flush		
			Full Flush		
3			Part Flush		
4			Full Flush		
4			Part Flush		
			Average effect	ive flushing volume (litres)	3.66
			Consump	otion / person / day (Litres)	16.18
КІТСН	EN SINK TA	PS	Fitting Type	Flow rate (litres/minute)	Number of fittings
		1	Kitchen	5.00	1
		2			
		3			
		4			
	_		Proporti	onate flow rate (litres/min)	3.50
			Consump	otion / person / day (Litres)	12.56
WAST	E DISPOSAI	LUNIT			
ls a w	vaste disposal u	nit spec	ified for the dwelling?	No	
			Consump	otion / person / day (Litres)	0.00
	D COETENE	R			
WATE	R SOFTENE				
WATE	K SUFTENE		ater Softener in use?	No	

Water con	sumed per regeneration (litres)		
Average number of re	generation cycles per day (No.)		
Number of occupa	ants served by the system (No.)		
	Water consume	ed beyond 4% person / day (Litres)	0.00

4th step - Analyse Results

Go to Start

INTERNAL WATER CONSUMPTION			
NET INTERNAL WATER CONSUMPTION	(litres/person/day)	109.76	
RAINWATER ONLY COLLECTION SAVING	(litres/person/day)	0.00	
GREYWATER ONLY RECYCLING SAVING	(litres/person/day)	0.00	
RAIN/GREYWATER COLLECTION SAVING (combined system)	(litres/person/day)	0.00	
NORMALISATION FACTOR	(litres/person/day)	0.91	
TOTAL WATER CONSUMPTION	(litres/person/day)	99.9	
CSH CREDITS ACHIEVED		3	
CSH MANDATORY LEVEL:		Level 3/4	

17. K COMPLIANCE			
EXTERNAL WATER USE	(litres / person / day)	5.00	
TOTAL WATER CONSUMPTION	(litres / person / day)	104.9	
	17. K COMPLIANCE?	Yes	

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PRINTING: before printing please make sure that in "Page Setup" you have selected the page to be as "Landscape" and that the Scale has been set up to 75% (maximum)