5B Prince Arthur Road Hampstead, London, NW3 6AX

SUSTAINABILITY AND ENERGY STATEMENT | JANUARY 2022

On behalf of Mr and Mrs Palsson



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Section 1 Executive Summary.

1 | Executive Summary

- 1.1 Iceni Projects Ltd was commissioned by Mr and Mrs Palsson to produce a Sustainability and Energy Statement for the proposed redevelopment of 5B Prince Arthur Road, Hampstead, London, NW3 6AX.
- 1.2 This application proposes the demolition of the existing property, and the construction of a new four storey plus basement family home, designed to be both contemporary and fit for the future.
- 1.3 Sustainability is a core consideration of this application, and has been considered from the outset. Resource and water efficiency have been maximised, whilst the production of waste and pollution is to be minimised, thus ensuring the impact of the proposals on its immediate surroundings and the environment as a whole is minimised.
 1.3 Sustainability is a core consideration of this application, and has been considered from the outset. Resource and water efficiency have been maximised, whilst the production of waste and pollution is to be minimised, thus ensuring the impact of the proposals on its immediate surroundings and the environment as a whole is minimised.
 1.7 Overall, the proposals constitute sustainable development in accordance with national, regional
- 1.4 Consideration has been given to the London Borough of Camden's Local Plan in the formulation of this strategy, aiming to minimise the environmental impact of the proposed development, and to ensure it is constructed to rigorous sustainability standards.
- 1.5 The proposed strategy has been based around the objectives of the Local Plan Policy CC1 (Climate change mitigation). In summary, based on this strategy, the proposed development:
 - will provide a new family home to replace the existing dwelling on-site;
 - will give consideration to the lifecycle environmental performance of the new dwelling when selecting materials to reduce embodied carbon;
 - will minimise internal water consumption to 105
 litres per person per day;
 - will retain the existing copper beech tree, and provide new planting to maintain and enhance the biodiversity of the site;
 - will manage surface water runoff through the incorporation of soft landscaping;
 - will minimise energy demand through the specification of low u-values, low air permeability and low thermal bridging to reduce heat loss; and
 - will utilise a highly efficient air source heat pump system to eliminate the need for on-site fossil fuel combustion to provide space and water heating,

mechanical ventilation with heat recovery, and a degree of comfort cooling.

- 1.6 By designing to rigorous energy standards, and omitting the use of fossil fuels for space and water heating through the employment of an air source heat pump system, the application will respond directly to the Climate Emergency declared by the Council in April 2019. These measures combine to provide a carbon dioxide emissions saving of 23.5%, compared to the Part L:2013 baseline, meeting and exceeding the requirements of the London Borough of Camden's policies to achieve a 19% reduction through on-site means alone.
- 7 Overall, the proposals constitute sustainable development in accordance with national, regional and local policy requirements, and will provide a new dwelling seeking to promote these principles in operation.

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Section 2 Introduction.

2 Introduction

- 2.1 Iceni Projects have been appointed by Mr and Mrs Palsson to prepare a Sustainability and Energy Statement for the proposals to redevelop 5B Prince Arthur Road, Hampstead, London, NW3 6AX.
- 2.2 This document details the sustainable design and construction methods adopted by the proposals and gives an overview of the design proposals that will ensure the development operates in a sustainable manner over the lifespan of the proposed dwelling. The Sustainability and Energy Statement report headlines will provide a framework for the project team to operate consistently within the sustainability guidelines set out by the London Borough of Camden.
- 2.3 The site is currently occupied by an infill development building on the former western portion of the garden of 5 Prince Arthur Road, within the Fitzjohns and Frognal ward of the London Borough of Camden. The site currently comprises a large detached house of two storeys with a three storey bay to the east.
- 2.4 The site is bounded by Prince Arthur Road to the north west. Large residential dwellings surround the site to the north east, south east and south west. The proposed development site falls within both the Fitzjohns Netherhall Conservation Area and the Hampstead Neighbourhood Plan Area. A mix of Queen Anne, Domestic Revival, Gothic and Neo-Georgian architectural styles characterise the Fitzjohn's subarea of the Conservation Area, however the site itself is not identified as being a property of particular interest.
- 2.5 This Statement has been produced to demonstrate how the proposals will meet the sustainability-related requirements of the London Borough of Camden, to provide a new dwelling that is fit for the future.
- 2.6 The report is structured to meet these guidelines as follows:
 - Section 3 summaries the proposals;
 - Section 4 discusses the planning context and policies which are relevant to sustainability;
 - Section 5 discusses the development response to the policy drivers for sustainability;
 - Section 6 discusses the development response to the policy drivers for energy; and
 - Section 7 summarises the development's design response.

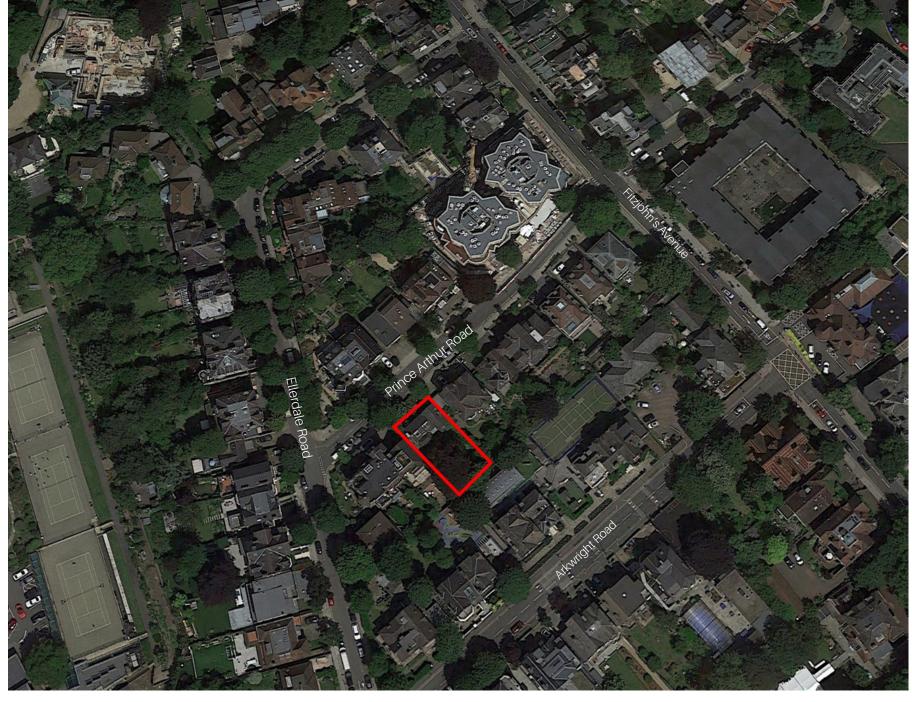


Figure 1.1 Aerial view of the site, marked in red

Section 3 The Proposal.

3 | The Proposal

- 3.1 The proposed development comprises the demolition of the existing dwelling on the site, and the erection of a replacement family home. It is intended that the new dwelling will:
 - better utilise space and light than the existing dwelling;
 - 2. provide a strong connection between the indoors and outdoors;
 - 3. promote lateral, rather than cellular, living;
 - benefit from improved sustainability and environmental credentials when compared with the existing dwelling;
 - 5. maintain and showcase the copper beech tree that gives the plot its distinctiveness; and
 - 6. positively contribute to the Hampstead street scene and conservation area, with architectural inspiration to be drawn from the character of the surrounding area.
- 3.2 The proposed front and rear elevations, illustrative floor plans and proposed roof plan are displayed to the right. The proposed site layout is provided in Appendix A1.



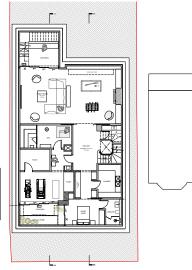


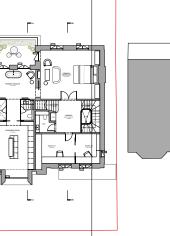
Figure 3.1 Proposed front elevations



Figure 3.2 Proposed rear elevations

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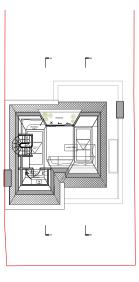


Figure 3.3 Proposed basement

Figure 3.5 Proposed first floor

Figure 3.7 Proposed third floor

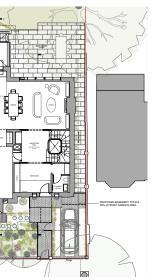


Figure 3.4 Proposed ground floor

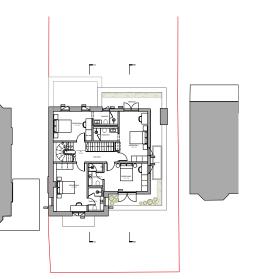


Figure 3.6 Proposed second floor

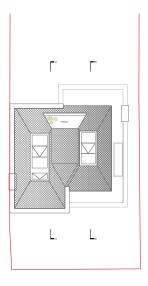


Figure 3.8 Proposed roof plan

Section 4 Planning and Regulatory Context.

4 | Planning and Regulatory Context

4.1 Built environment sustainability is incorporated within National Planning Policy Framework policy and regulation at a national, regional and local level, as set out below.

NATIONAL

Climate Change Act 2008

- 4.2 On 26th November 2008, the UK Government published the Climate Change Act 2008; the world's first long-term legally binding framework to mitigate against climate change. Within this framework, the Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target set out in the Energy White Paper, to 80% by 2050.
- 4.3 As required under Section 34 of the Climate Change 4.6 Act, the Sixth Annual Carbon Budget was accepted by the Government in April 2021. This sets out a budget for UK emissions for the period 2033-2037.
- 4.4 Following a commitment in June 2019, the Climate Change Act has been amended to target net zero emissions by 2050.

	Climate Change Act 2008
	CHAPTER 27
	CONTENTS
	Part 1
	CARBON TARGET AND BUDGETING
	The target for 2050
2	The target for 2050 Amerilment of 2050 target or baseline year Consultation on order amending 2050 target or baseline year
	Carbon budgeting
	Carbon budgets
6	Level of carbon budgets Amendment of target percentages
7	Consultation on order setting or amending target percentages Setting of carbon budgets for budgetary periods
9	Consultation on carbon budgets
10	Matters to be taken into account in connection with carbon budgets
	Limit on use of carbon units
11	Limit on use of carbon units
	Indicative annual ranges
12	Duty to provide indicative annual ranges for net UK carbon account
	Proposals and policies for meeting carbon budgets
13	Duty to prepare proposals and policies for meeting carbon budgets
14	Duty to repare proposals and policies for intering carbon budgets Duty to report on proposals and policies for meeting carbon budgets Duty to have regard to need for UK domestic action on climate change

- 4.5 The Department for Communities and Local Government determines national policies on different aspects of planing and the rules that govern the operation of the system. Accordingly, the National Planning Policy Framework (NPPF), which came into force in March 2012 and was updated in February 2019, aims to strengthen local decision making. Additional updates have since been made through the latter half of 2020 and in January and July 2021 to reflect changes related to use classes, permitted development rights, the calculation of housing need, and requirements to achieve beauty alongside sustainability.
- Paragraph 10 of the NPPF confirms that at the heart of this document is a "presumption in favour of sustainable development", and that development proposals that accord with an up-to-date development plan should be approved without delay.
- Paragraph 7 states that the purpose of the planning system is to contribute to the achievement of

Ministry of Ho Communities Local Govern	&		
i Local Govern	ment		
National Pl	anning Policy F	ramework	

the objective of sustainable development can be summarised as meeting the needs of the ^{4.7} present without compromising the ability of future generations to meet their own needs.

- An Economic Role ensuring the provision of land and infrastructure needed to help build a strong, responsive and competitive economy.
- A Social Role supplying the required amount of housing while at the same time ensuring and 4.8 building strong, vibrant and healthy communities. Ensuring the built environment is sited around accessible local services which help support a community's *health, social and cultural well*being.
- An Environmental Role ensuring development contributes to the protection and enhancement of the natural, built and historic environment through the improvement of biodiversity, minimising the use of natural resources and production of pollution/ waste, and guaranteeing sufficient adaptation to climate change.

National Planning Practice Guidance

- Climate Change advises how planning can identify suitable mitigation and adaptation measures in plan-making and the application process to address the potential for climate change.
- **Design** design impacts on how people interact with places and can affect a range of economic, social and environmental objectives. The guidance states that planning policies and decisions should seek to ensure that the physical environment supports these objectives.
- **Natural Environment** explains key issues in implementing policy to protect biodiversity, including local requirements.
- Renewable and Low Carbon Energy the guidance is intended to assist local councils in developing policies for renewable energy in local plans, and identifies the planning considerations for a range of renewable sources.

sustainable development. At a very high level, Future Homes Standard 2025 (March 2019)

- Within the Spring Statement 2019, The Chancellor announced the future introduction of the Future Homes Standard 2025. The Standard will mandate the end of fossil fuel heating systems in new homes from 2025 and target "world-leading levels of energy efficiency". In doing this, the Standard aims to utilise green technology to reduce environmental impacts, as well as reducing consumer energy bills.
- This Standard is expected to build on the Prime Minister's Clean Growth Grand Challenge mission, which aims to at least halve the energy usage of new build properties by 2030. It also looks to halve the costs of renovating existing buildings to achieve a similar standard of energy efficiency as new buildings, whilst improving their quality and safety.

Ministry of Housing, Communities & Local Government

The Future Homes Standard

2019 Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings

4 Planning and Regulatory Context

REGIONAL

4.9 Within Greater London, key sustainable development principles for economic, environmental and social improvement are set out below:

The London Plan (March 2016)

- 4.10 The London Plan was the overall strategic plan for London at the time of the original submission and 4.11 Since the original submission of the application, included policies for sustainable development and energy within Chapter 5 (London's response to climate change). Key policies of relevance to this scheme are as follows:
 - Policy 5.2 Minimising Carbon Dioxide Emissions. This states that development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:
 - 1. Be lean: use less energy
 - 2. Be clean: supply energy efficiently

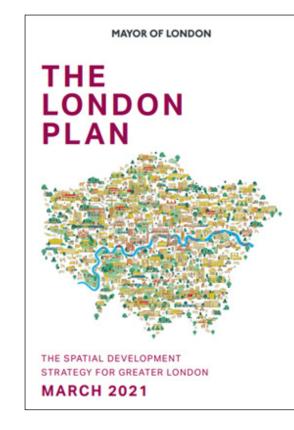
- 3. Be green: use renewable energy
- Policy 5.3 Sustainable Design and Construction. This states that development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and should ensure that they are considered at the beginning of the design process.
- the new London Plan was adopted in March 2021. Policies for sustainable development and energy are included within Chapter 9, with the following key policies relevant to this scheme:
- Policy SI2 Minimising Greenhouse Gas Emissions. This states that development proposals should reduce greenhouse gas emissions in operation and minimise both annual and peak energy demand in accordance with the following energy hierarchy:
- 1. Be lean: use less energy and manage demand during operation

- 2. Be clean: exploit local energy resources (such as LOCAL secondary heat) and supply energy efficiently and cleanly
- 3. Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- 4. Be seen: monitor, verify and report on energy performance

Sustainable Supplementary Planning Guidance (SPG) (April

4.12 This document provided guidance on the implementation of London Plan Policy 5.3 'Sustainable Design and Construction', as well as a range of policies relating to environmental sustainability. The 4.15 Policies of relevance to the proposed development document contained best practice and priority targets for a range of issues related to sustainable design and construction, grouped into three categories: resource management, adapting to climate change and greening the city, and pollution management.







SUSTAINABLE DESIGN AND CONSTRUCTION SUPPLEMENTARY PLANNING GUIDANCE

MAYOR OF LONDON

APRIL 2014

LONDON PLAN 2011 IMPLEMENTATION FRAMEWORK

Camden Local Plan (2017)

- 4.13 The Camden Local Plan sets out the Council's planning policies to ensure that Camden continues to have robust, effective and up-to-date planning policies that respond to changing circumstances and the borough's unique characteristics and contribute to delivering the Camden Plan and other local priorities.
- **Design** and **Construction** 4.14 The overall vision of the Camden Plan, and the Local Plan, is as follows:
 - We want to make Camden a better borough a place where everyone has a chance to succeed and nobody gets left behind. A place that works for everyone.
 - include:
 - Policy D1 Design. This states that, in order to secure high quality design, the Council will require that development:



Camden

- respects local context and character;
- is sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation;
- adaptable to different activities and land uses;
- guality and complement the local character;
- responds to natural features and preserves gardens and other open space;
- incorporates high quality landscape design and maximises opportunity for greening for example 4.17 through planting of trees and soft landscaping; and
- for housing, provides a high standard of accommodation.
- · Policy CC1 Climate change mitigation. This states that the Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation by:
- requiring all development to reduce carbon dioxide emissions through following the steps in the Energy Hierarchy;
- expecting all developments to optimise resource efficiency; and
- requiring all new residential development to demonstrate a 19% CO_a reduction below Part L:2013 Building Regulations.
- Policy CC2 Adapting to Climate Change. This states that, to ensure resilience to climate change, all development should adopt appropriate climate change adaptation measures such as:
- not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and the use of Sustainable Drainage Systems;
- incorporating biodiverse roofs, combination

appropriate; and

 measures to reduce the impact of urban and dwelling overheating, including application of the Cooling Hierarchy.

• is of sustainable and durable construction and Camden Planning Guidance (CPG): Energy Efficiency and Adaptation (March 2019)

- comprises details and materials that are of high 4.16 This document was published to support the policies set out within the Camden Local Plan (2017). It provides guidance on key energy and resource issues within the London Borough of Camden, and supports Local Plan Policies CC1Climate change and mitigation, and CC2 Adapting to climate change.
 - Other policies for which guidance is provided include: C1 Health and well-being; A1 Open space; A2 Biodiversity; D1 Design; D2 Heritage; CC3 Water and flooding; CC4 Air quality; and, CC5 Waste.
 - 4.18 This CPG also outlines the requirements for producing Energy Assessments and Sustainability Statements.

Camden Planning Guidance

Energy efficiency and adaptation

March 2019



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green and blue roofs, and green walls where Declaration of a Climate Emergency (April 2019)

4.19 On 8th April 2019, the London Borough of Camden's Cabinet Member for Improving Camden's Environment, Councillor Harrison, declared a climate emergency. As part of this declaration, the following full Council debate was to be dedicated to climate change. It was also noted that the Council would be convening a Citizens' Assembly with a special focus on climate change, and involving young people as much as possible.

Section 5 Sustainability Statement.

5 | Sustainability Statement

- to the Greater London Authority (GLA), the sustainability strategy for the proposed development has been assessed using the GLA supplementary planning guidance (SPG) 'Sustainable Design and Construction'. This enables a holistic sustainability approach for the proposed development. The principle of sustainable design and construction is referenced within the London Borough of Camden's Local Plan, and therefore the GLA's 'Sustainable Design and Construction' SPG represents best practice guidance to meet high standards of sustainable design and construction.
- 5.2 This Sustainability and Energy Statement for the proposed dwelling at 5B Prince Arthur Road is divided into two main parts:
 - In line with the categories highlighted within the GLA's SPG on 'Sustainable Design and Construction', the sustainability features of the proposed development are outlined within this section.
 - The carbon dioxide (CO₂) emissions reduction strategy for the proposed dwelling is based on the Energy Hierarchy to provide a rigorous methodology. This strategy, which maximises costeffective opportunities for emissions reductions, is detailed in Section 6 of this report.

Land

by a detached 2-3 storey, large residential dwelling with a private rear garden. It is currently in use as a single family residential dwelling (Use Class C3).



Figure 5.1 View of the existing site

- 5.5 The utilisation of this site will ensure that the proposed dwelling is constructed on a previously used (brownfield) site, thus reducing development on greenfield and Green Belt sites.
- 56 The proposed dwelling has been designed in line with the scale and massing of the neighbouring properties. This will ensure that the form of the proposed scheme will fit within the street scene, whilst also respecting the neighbouring buildings, as shown in Figure 5.2 below.



Figure 5.2 Street elevation of the proposed dwelling (front)

53

Location and Transport

- 5.1 Although the proposed scheme is not referable 5.4 The site, as shown in Figure 5.1, is currently occupied 5.7 The site is located towards the western end of Prince 5.11 The fabric of the existing building is of poor quality, Arthur Road, to the south of the main town centre around Hampstead station, and west of Hampstead High Street.
 - There are numerous public transport connections for London Underground, rail and the London bus network within the local area, with the site scoring a PTAL rating of 3, as shown in Figure 5.3.
 - Hampstead station, located approximately 5-minutes' 5.9 walk to the north, is served by the London Underground Northern line. To the south west, Finchley Road and Frognal station, which is served by the London Overground line, is a 10-minute walk from the site.
 - 5.10 In addition to this, the site is located within walking distance of two bus stops, served by the number 46 route between Lancaster Gate and the City of London.

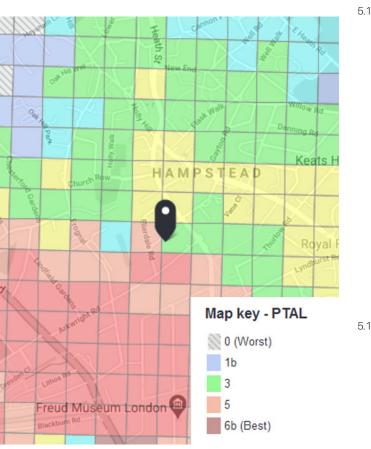


Figure 5.3 Extract from TfL PTAL map

Justification for Demolition

- due to a lack of insulation within the existing walls and roof spaces, as well as the presence of large areas of glazed roofs and single glazed windows throughout. In order to improve the energy efficiency of the existing dwelling, significant modifications would be necessary, which would be very costly, and may require alterations to the structure of the building. Due to constraints associated with the retrofitting of existing buildings, it is possible that the retrofitted dwelling may not achieve levels of fabric efficiency compliant with the current Building Regulations. The proposed replacement dwelling will employ building fabric efficiencies that are improved over the minimum standards outlined within the current Building Regulations. This will ensure that the energy demand associated with space heating within the replacement dwelling will be minimised as far as possible, reducing both demand on the national grid, and the carbon dioxide emissions associated with heating.
- 5.12 In addition to this, the space and water heating demand of the existing building is currently served by a gas boiler. When accounting for the projected decarbonisation of the national electricity grid, and the emerging trend towards the use of all electric systems, the use of a gas boiler represents a more carbon-intensive solution. Retrofitting an existing building with an electric system, such as an air source heat pump (ASHP) system, is costly and without major improvements to the fabric efficiency of the existing dwelling, would be unlikely to deliver significant savings with respect to carbon dioxide emissions. The proposed replacement dwelling will seek to employ an electric ASHP system to serve both space and water heating demands. As the national grid continues to decarbonise, the carbon dioxide emissions associated with this system will also fall, aiding in meeting both the local and national net-zero carbon emissions targets for new buildings during operation.
- 5.13 Poor quality fabric efficiency and the use of gas boilers as individual issues have long-term carbon emission consequences, however demolition and replacement provide an opportunity to address both. It may therefore be concluded that, with respect to operational carbon dioxide emissions, the proposed replacement dwelling will be far more energy efficient than the existing dwelling. This therefore supports the principle of demolition of the existing building.

5 | Sustainability Statement

Water Efficiency

- during dry weather. As the population of London grows, this situation will be further exacerbated, with increased pressure on the supply of potable water.
- 5.15 In order to actively mitigate against this, water saving fittings and appliances shall be installed to target a water consumption rate of 105 litres or less per person per day, based on the DCLG water efficiency calculator for residential dwellings. Full details of the water calculation are provided in Appendix A2.
- 5.16 Subject to changes at later detailed design stages, it is proposed that the following measures will be incorporated:
 - Low volume, dual flush toilets of 6/3 litres.
 - Water consumption levels no higher than 3 litres/ minute in hand-wash basins, and 4 litres/minute in kitchen sinks.
 - Bath with a capacity to overflow no higher than 180 litres.
 - Showers with a flow rate of 8 litres/minute using a flow restrictor.
 - Washing machine with water consumption no more than 18 litres/kg.
 - Dishwasher with water consumption of no more 5.22 Furthermore, applying the principles of a circular than 4.5 litres per place setting.
- 5.17 It is intended that, to further reduce the consumption of water post-development, storage tanks to facilitate the recycling of grey- and/or rainwater will be provided. This will contribute to a reduction in the use of potable 5.23 During operation, a dedicated storage area will be water

Materials and Waste

- of factors, such as the architectural context, design rationale, embodied carbon and maintenance requirements. For the proposed dwelling, consideration will be given to the lifecycle environmental performance, with materials selected in consideration of the BRE's Green Guide to Specification, aiming for A 5.25 An arboricultural survey has been undertaken and or B rated materials wherever possible.
- 5.19 During the detailed design of the building fabric, consideration will be given to minimising the 5.26 The proposals have been carefully considered around environmental impact of materials, by selecting nontoxic and robust materials to ensure longevity and a minimal impact on the health of the occupants.
- 5.20 Timber will be selected and purchased in consideration of sustainability certification. It is intended that all structural timber elements, along with any timber used for temporary uses such as scaffolding, will be sustainably sourced. This may include FSC and/or 5.27 PEFC sources.
- 5.21 Where possible, it is intended that locally sourced materials will be employed during the construction of the proposed dwelling. This will aid in ensuring materials that are is in keeping with local vernacular are employed, whilst also contributing to the minimisation of the embodied carbon associated with these materials.
- economy, whereby the use of recycled and reused materials is prioritised, where feasible will also aid in minimising the embodied carbon associated with the dwelling.
- incorporated for the storage of recycling and general waste, in line with the requirements of the London Borough of Camden policy.

Nature Conservation and Biodiversity

- 5.14 The city often consumes more water than is available 5.18 The selection of materials is determined by a variety 5.24. The site in its current state comprises an existing 5.28. Inorderto protect the development against overheating dwelling with a private rear garden. The rear garden currently comprises a significant area of hardstanding, as well as a network of retaining walls, including a garden house, all with concrete foundations.
 - advice sought in relation to the existing trees, in particular the Copper Beech tree at the rear.
 - the Copper Beech tree, which is to be retained. Furthermore, it is proposed to remove the current hardstanding and concrete base structures within the garden, which are considered to currently be acting as a barrier to the root growth of the copper beech tree. This will aid in re-establishing the permeable ground around the roots of the tree.
 - In addition to this, soft landscaping will be incorporated within the rear garden, as shown in Figure 5.4 below.

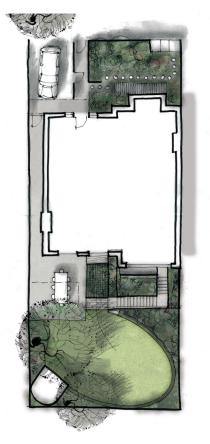


Figure 5.4 Proposed landscaping

Tackling Increased Temperatures and Drought

in the future, a number of key design features have been proposed to ensure the new dwelling is resilient to increased temperatures which may be experienced as a result of climate change and the urban heat island effect. A summary of the measures included to reduce the risk of overheating is provided below.

5.29 The design of the proposed dwelling has been developed in line within the GLA's recommended 'Cooling Hierarchy' approach, detailed in London Plan Policy 5.9. This applies a similar principle to the thorough decision-making process of the Energy Hierarchy, with the aim of reducing CO₂ emissions from cooling, and minimising the risk of overheating where no cooling is present:

Minimisation of internal heat generation through energy efficient design

- Heat gain from lighting is kept to a minimum as a result of an energy-efficient lighting design solution.
- The availability of natural light is maximised by optimising the light transmittance of the glass elements of the façade.
- Heat gains from equipment will be minimised through the specification of low energy systems.
- The scheme will use an air source heat pump for heating and hot water. This is a low temperature distribution system, leading to lower internal heat gains from distribution pipework.

Reduction of the amount of heat entering the building in the summer

• The building's façades have a balanced amount of glazing to optimise daylight penetration, without increasing the risk of overheating arising from solar gain.

Management of the heat within the building

· The proposed dwelling will have high ceilings, promoting increased air movement and stratification, whereby warmer air rises, thus aiding to mitigate overheating.

Passive ventilation

• Openable windows on multiple aspects across

that utilises cross-flow and stack ventilation to maximise the potential for natural ventilation within the proposed dwelling.

Mechanical and active cooling

 Cooling may potentially be provided by the proposed Nilan Compact P system, which includes a reversible cooling unit capable of cooling air used for ventilation only. Whilst this cooling will not be the equivalent of air conditioning, whereby the air within a space is cooled to a specified temperature, the use of a reversible cooling unit allows the specified system to cool incoming air by up to 5.32 10°C. In this way, supply air can be cooled during warm periods, without affecting the efficiency with which hot water is produced. The inclusion of this technology has been accounted for within the energy modelling detailed within the Energy Strategy section of this report.

Flooding

- all floors will provide a passive ventilation strategy 5.30 Figure 5.5 below confirms that the proposed site is Air Pollution located in Flood Zone 1, and is not at risk of flooding from rivers or the sea, reservoirs or surface water.
 - 5.31 The proposed reduction in hardstanding area through it appears that any air quality 'Objective' prescribed in The development is not located within close proximity the removal of the existing built structures in the rear the regulations and in the National Air Quality Strategy to transport noise sources. The closest road noise garden, and the re-establishment of permeable ground is not likely to be achieved, then the Local Authority sources are Rosslyn Hill (A502) to the east, and Finchley around the roots of the Copper Beech tree, will aid in must designate the affected area as an Air Quality Road (A41) to the west of the site. However, the below reducing the volume of surface water runoff on-site. Management Area (AQMA). map (top) shows that noise from these roads will have Furthermore, the incorporation of soft landscaping will 5.34 The site location, and the whole of the London Borough no impact on the new dwelling. positively contribute to the management of the 5mm of Camden, is specified as an AQMA, due to excessive storm event, therefore limiting runoff for the typical The site is also not located within close enough levels of nitrogen dioxide (NO₂) and particulate matter ^{5.38} everyday rainfall event. proximity to any rail lines for noise from this source to (PM_{10}) arising from road transport. impact on the occupants in the future, as demonstrated The management of surface water in this way will 5.35 Figure 5.6 below shows the levels of NO2 and PM10 on the map below (bottom).
 - reduce the burden on the existing Thames Water measured at the site in 2016. These images indicate sewer network, as well as reducing the risk of flooding that the levels of NO₂ and PM₁₀ present at the site on-site and within the immediate surroundings. in 2016 would have been below the annual mean objectives for both pollutants.

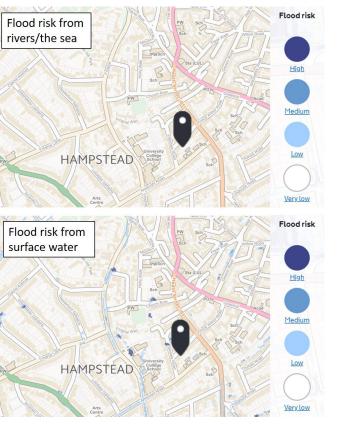


Figure 5.5 Extract from the Environment Agency's online flood map

Pollution

5.33 The Environment Act 1995 requires all Local Authorities to review air quality within their districts. If Noise Pollution

5.36 No fossil fuels will be used for the building systems proposed for the new dwelling, and it is anticipated that transport emissions may be mitigated by encouraging

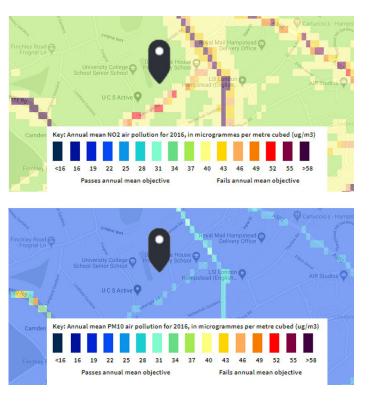


Figure 5.6 Maps indicating annual levels of NO (top) and PM₁₀ (bottom) exposure

the occupants to cycle through the provision of bicycle storage within the new dwelling.

In addition to this, the air source heat pump (ASHP) 5.39 system proposed to serve the space and water heating demand of the new dwelling is quiet in operation. As the design progresses, acoustic measures should be considered to further limit the noise generated by the outside unit of the system, should this be deemed necessary.

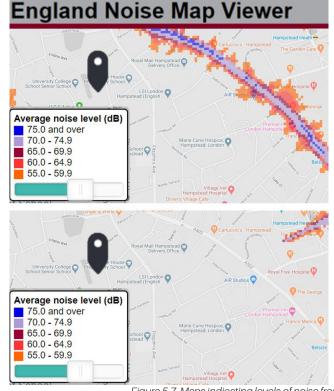


Figure 5.7 Maps indicating levels of noise from road (top) and rail (bottom) sources

Section 6 **Energy Strategy**.

6 | Energy Strategy

The Energy Hierarchy

- and industry best practice detailed in Section 4, a comprehensive energy and carbon dioxide (CO₂) emissions assessment has been carried out for the proposed scheme. The energy performance of the scheme has been analysed and evaluated against the most up-to-date iteration of Part L of the Building Regulations and pertinent London Borough of Camden policies, accounting for economic, technical and functional feasibility.
- 6.2 The proposed energy strategy is based upon the principles of the Energy Hierarchy on the basis that it is ^{6.7} preferable to reduce carbon dioxide emissions through reduced energy consumption above decarbonisation through alternative energy sources.
- 6.3 The tiers of the Energy Hierarchy are:
 - Be Lean | Use less energy
 - Be Clean | Supply energy efficiently
 - Be Green | Use renewable energy

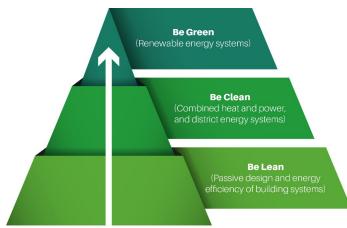


Figure 6.1 The Energy Hierarchy

6.4 Design recommendations were provided to TR Studio, and preliminary design assessments were carried out to enable an energy strategy to develop from an early 6.10 stage.

'Be Lean' | Use Less Energy

- 6.1 With reference to the policy requirements, guidance 6.5 Within the first stage of the energy hierarchy, it is proposed to incorporate high levels of passive and energy efficient design measures in order to reduce the development's energy consumption and associated CO₂ emissions.
 - 6.6 It is technically possible to exceed Building Regulations requirements through demand reduction measures alone, and it is an expectation of the Greater London 10% reduction via the 'Be Lean' stage.
 - The proposed development includes a wide range of energy efficiency measures, intended to reduce energy demand.
 - 6.8 The following U-values are proposed as a means of limiting heat loss through the dwelling's building fabric:

Building Fabric Element	Part L1A:2013 backstop U-values (W/m²K)	Proposed U-values (W/m²K)
Ground floor	0.25	0.08 - 0.10
External wall	0.30	0.13 - 0.15
Roof	0.20	0.10 - 0.12
Exposed ceilings/floors	0.25	0.13 - 0.18
Windows	2.00 (including frame)	1.30 (including frame)
Doors	2.00	1.00

- 6.9 The glazing will be double glazed, argon filled with a low emissivity coating. Although this has yet to be formally specified, it is expected that window U-values will be 1.3 W/m²K or better (including frame), with a g-value of 0.63, and light transmission of ~70% to improve natural daylight penetration.
- A high level of airtightness is proposed, where a level equal to or below 3 m³/h/m³ shall be targeted, meaning that air infiltration between the internal and the external environment will be largely controlled, and space heating/cooling demand further reduced.
- 6.11 The other significant means of heat loss from dwellings is due to thermal (cold) bridging. This is typically a construction detail which has higher thermal

conductivity than the surrounding materials, creating a path of least resistance for heat transfer. Thermal bridges result in an overall reduction in thermal resistance of the building elements and should be designed out where possible to minimise unwanted heat loss. In order to minimise heat loss through thermal bridges, accredited construction details have been assumed, with an equivalent y-value of 0.05.

- Authority (GLA) that new dwellings achieve at least 6.12 High efficiency plant, equipment and controls are proposed to limit the energy consumed in order to provide the required level of indoor environmental performance and control. Performance efficiency values were tested and improved in energy models to benchmark the resulting predicted CO₂ reduction.
 - throughout the dwelling.
 - In order to assess the CO₂ emissions reductions achieved through the 'Be Lean' stage, space and water heating demand is served by an individual gas-fired boiler with an efficiency of 90%.
 - Although the dwelling will be provided with opening windows to mitigate against overheating,outside

air will be provided via mechanical ventilation with heat recovery (MVHR), with a specific fan power (SFP) of 0.88 W/l/s. A heat exchanger with an efficiency of >90% has also been specified. These efficiencies are higher than those set out in the Domestic Building Services Compliance Guide.

- Time and temperature zones, controlled by the suitable arrangement of plumbing and electrical services, will be employed to control heating consumption within the dwelling.
- 6.13 Energy modelling of the proposed dwelling has been undertaken using the Standard Assessment Procedure (SAP).
- Low energy LED lighting will be installed 6.14 The carbon dioxide emissions for the dwelling under the 'Be Lean' tier of the Energy Hierarchy are shown to the right. DER and TER worksheets showing the 'Be Lean' performance of the dwelling are provided in Appendix A3.
 - 6.15 The analysis presented below shows that the proposed dwelling will achieve a carbon dioxide emissions saving of 10.7% through energy efficiency means alone, under the 'Be Lean' scenario.

(m)	, 12-	Part L:2013 Target Emissions Rate
per annu	10	
s (kg/m ²	8	Minimum 19% saving on-site
Regulated CO $_2$ emissions (kg/m 2 per annum)	6	
ed $CO_2 \in$	4	
Regulat	2	
	0	•
		Be Lean
		Regulated emissions Carbon savings
		Figure 6.2 Carbon dioxide emissions ('Be Lean')

TER: Baseline Part L1A:2013 Emissions (kgCO ₂ per annum)	DER: Proposed 'Be Lean' Emissions (kgCO ₂ per annum)	Emissions Savings (kgCO ₂ per annum)	Emissions Savings (%)
11.9	10.6	1.3	10.7%

6 Energy Strategy

'Be Clean' | Supply Energy Efficiently

- 6.16 The potential for the proposed dwelling to incorporate a low carbon heating/cooling system has been reviewed, in line with the hierarchy presented in London Plan Policy 5.6:
 - 1. Connection to existing heating or cooling networks;
 - 2. Site-wide CHP network; and
 - 3. Communal heating and cooling.
- 6.17 The London Heat Map is a tool provided by the Mayor of London to identify opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study.
- 6.18 The image displayed in Figure 6.3 is an extract from the London Heat Map, showing the area in the vicinity of the site. It illustrates;
 - Heat demand (areas of higher heat demand are shown in red);
 - Existing heat networks (shown as red lines);
 - Proposed heat networks (shown as orange lines); and
 - Heat network priority areas (white with black borders).
- 6.19 The extract displayed in Figure 6.3 indicates that the site of the proposed dwelling is located within an area of low heat demand, with no planned or existing heat networks within the vicinity. It is also located outside local heat network priority areas.
- 6.20 Given the scale and density of the proposed development, the establishment of a new heat network is unfeasible. Furthermore, the use of combined heat and power (CHP) is also considered to be unviable for the proposed site, based on the most up-to-date GLA energy guidance, which looks to move away from the use of natural gas to meet space and water heating demands. It is therefore recommended that an air source heat pump (ASHP) system is employed to service the space and water heat demand of the new dwelling. The incorporation of heat pump technology is discussed in greater detail in the 'Be Green' section.
- 6.21 The "Be Clean" carbon dioxide emissions are therefore identical to those set out in the "Be Lean" scenario.

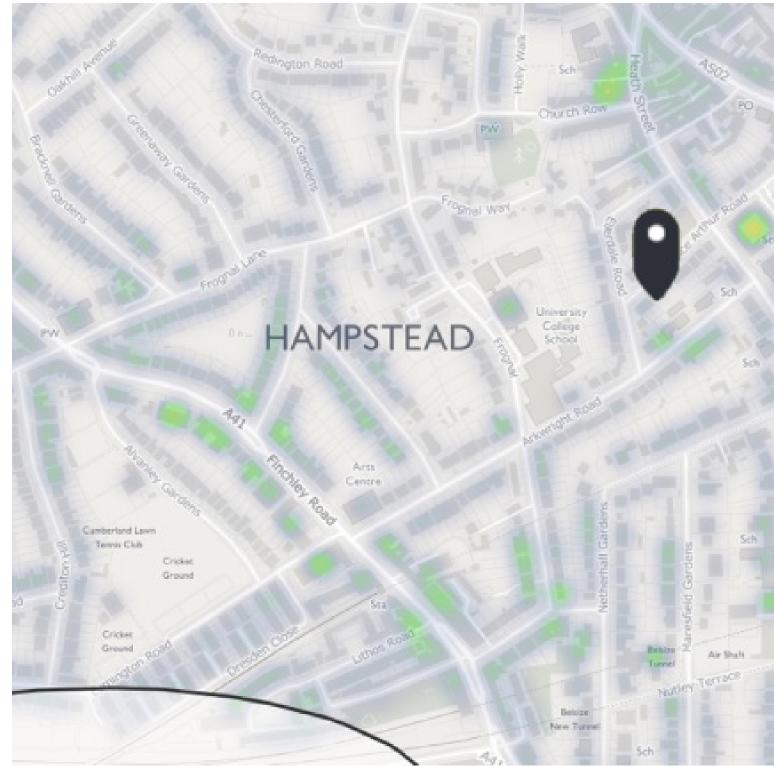




Figure 6.3 Extract from the London Heat Map

'Be Green' | Utilise Renewable Technologies

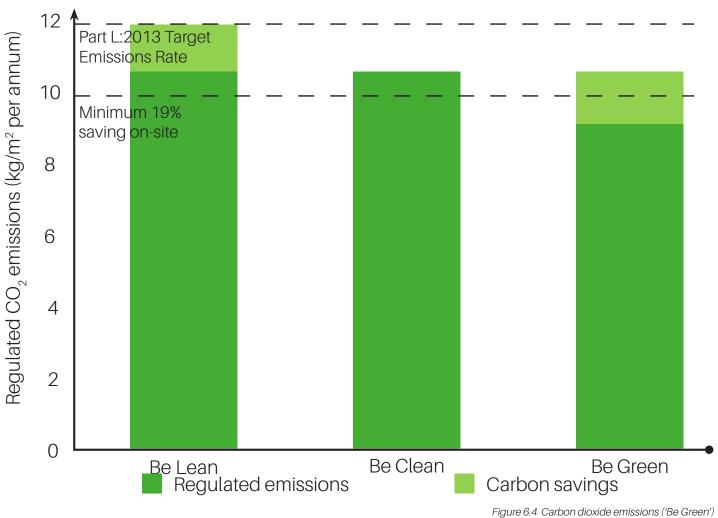
- 6.22 The proposed development has given consideration to renewable energy technologies that may be applicable to deliver the required level of carbon dioxide savings over the Part L1A:2013 baseline, and the likely local effects on the environment.
- 6.23 In determining the appropriate renewable technology for the site, a number of factors including carbon dioxide savings, site constraints, and potential visual impacts have been considered. Further details of each technology and its associated assessment in relation to the proposed new dwelling are provided below.
 - **Biomass** This technology is not considered a practical solution for reducing carbon dioxide, in the view of limited options for domestic scale installations, storage space requirements for the combustible material, and the transport related carbon dioxide emissions which are not normally accounted for within energy modelling. Furthermore, high levels of nitrous oxide (NOx) and particulate matter (PMx) emissions are associated with the use of biomass fuel. As the proposed dwelling is located within a dense, urban area, permitted emissions will be restricted.
 - Air Source Heat Pumps (ASHP) given the site location and lack of existing or proposed heat networks, it is proposed that air source heat pump (ASHP) technology is incorporated within the development. It is expected that a highly efficient system, such as the Nilan Compact P, will be employed to serve both the space and water heating demands of the proposed dwelling. This system also provides mechanical ventilation with heat recovery (MVHR) and includes a reversible cooling unit, allowing for the provision of comfort cooling. Typical manufacturer specifications for the proposed Nilan Compact P system quote a heating coefficient of performance of approximately 4.2. The specified system is guiet in operation, though it is recommended that measures to further mitigate the sound produced by the external component of the proposed system are considered during detailed design. In addition to this, the proposed system provides an element of cooling, which has been accounted for within the SAP calculations by assuming an Energy Efficiency Ration (EER) of 3.
 - Ground Source Heat Pumps (GSHP) Due to the nature of the proposed development, the site is not

- suitable for a horizontal ground collection loop. 6.26 The Energy Performance Certificate (EPC) for the Furthermore, ground investigation and borehole drilling are likely to be cost prohibitive, and may not yield a suitable energy source. The use of ground source heat pumps for the proposed scheme is therefore not considered viable.
- Photovoltaics (PV) Whilst the orientation of the site faces south-east, the proposed form of the roof means that areas of roof facing south-east would not offer a large enough area to house PV panels. Furthermore, the significant size of the copper beech tree in the southern corner of the rear garden may cause the south-east facing portion result in the output of PV panels being significantly reduced. Based on this, it is considered that the employment of PV panels would not be suitable for the proposed development.
- · Solar Thermal Hot Water (STHW) This technology is presently rejected, as domestic hot water is proposed to be provided by a highly efficient air source heat pump system. In addition to this, hot water demand is considered to be outside the energy generating period for the solar thermal panels, meaning its ability to significantly reduce carbon emissions during operation is limited. Furthermore, as outlined above with regards to photovoltaic (PV) technology, the area of southeast facing roofspace available will not be of a sufficient size to house the solar thermal panels, and the potential overshadowing caused by the copper beech tree would significantly reduce the efficiency of this technology.
- Wind Turbines This technology is rejected on the basis of its potential impact on visual amenity \bigcirc and relatively low efficiency from unpredictable, turbulent wind conditions associated with urban locations.
- As for the 'Be Lean' stage, 'Be Green' energy analysis 6.24 has been carried out for the proposed development $\check{\mathbf{C}}$ using the Standard Assessment Procedure (SAP).
- 6.25 The carbon dioxide emissions for the proposed development, under each tier of the Energy Hierarchy, are shown in Figure 6.4. DER and TER worksheets showing the 'Be Green' performance of the proposed dwelling are provided in Appendix A3.

- dwelling that currently stands on the site indicates that it achieves a rating of 56, which is only marginally within band D (scores between 55 and 68). The EPC for the proposed dwelling, provided in Appendix A4, shows it will achieve a rating of 88, which is within band B (scores between 81 and 91). This is higher than the average energy efficiency of 60 for a dwelling in England and Wales, as well as the energy efficiency of 56 currently achieved, and the efficiency of 78 potentially achieved, by the existing dwelling. The EPC of the existing dwelling is also provided in Appendix Δ1
- of the roof to become overshadowed. This would 6.27 The energy analysis carried out shows that the proposed development achieves a carbon dioxide emissions saving of 23.5% through energy efficiency

measures and renewable technologies. This exceeds the 19% target necessary to meet the requirements of the London Borough of Camden.

TER: Baseline Part L1A:2013 Emissions (kgCO ₂ per annum)	DER: Proposed 'Be Green' Emissions (kgCO ₂ per annum)	Emissions Savings (kgCO ₂ per annum)	Emissions Savings (%)
11.9	9.1	2.8	23.5%



Section 7 **Conclusion**

7 | Conclusion

- 7.1 This Sustainability and Energy Statement provides an overview as to how the proposed development at 5B Prince Arthur Road contributes to sustainable development in the context of national, regional and local considerations.
- of Camden's Local Plan, and the Greater London Authority's (GLA) London Plan in the formulation of this statement. The overall development has been assessed using the GLA's supplementary planning guidance (SPG) 'Sustainable Design and Construction', providing a holistic sustainability approach for the building.
- 7.3 Sections 5 and 6 of this statement demonstrate that the siting and design of the proposals support relevant policy relating to sustainable development. This shows that the proposed development:
 - will provide a new family home to replace the existing dwelling on-site;
 - will give consideration to the lifecycle environmental performance of the new dwelling when selecting materials to reduce embodied carbon;
 - will minimise internal water consumption to 105 litres per person per day;
 - will retain the existing copper beech tree, and provide new planting to maintain and enhance the biodiversity of the site;
 - will manage surface water runoff through the incorporation of soft landscaping;
 - will minimise energy demand through the specification of low u-values, low air permeability and low thermal bridging to reduce heat loss; and
 - will utilise a highly efficient air source heat pump system to eliminate the need for on-site fossil fuel combustion to provide space and water heating, mechanical ventilation with heat recovery, and a degree of comfort cooling.
- 7.4 By designing to rigorous energy standards, and omitting the use of fossil fuels for space and water heating through the employment of an air source heat pump system, the application will respond directly to the Climate Emergency declared by the Council in April 2019. These measures combine to provide a

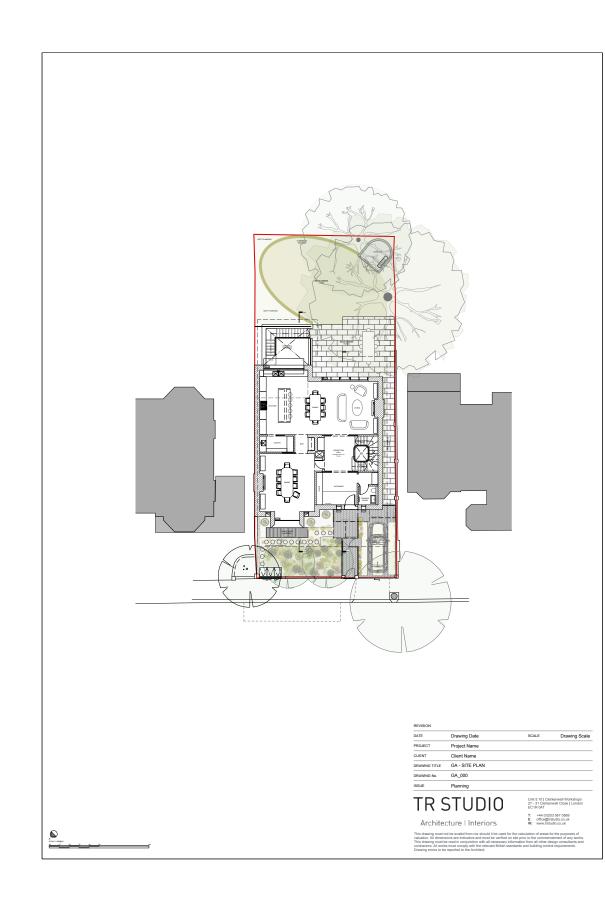
carbon dioxide emissions saving of 23.5%, compared to the Part L:2013 baseline, meeting and exceeding the requirements of the London Borough of Camden's policies to achieve a 19% reduction through on-site means alone.

7.2 Consideration has been given to the London Borough 7.5 Overall, the proposals for the scheme are in line with the principles of sustainable development, as well as the policy requirements of the NPPF and the London Borough of Camden, and will provide a new dwelling that seeks to promote these principles in operation.

5B PRINCE ARTHUR ROAD | HAMPSTEAD

Appendix A1 Site Layout.





5B PRINCE ARTHUR ROAD | HAMPSTEAD

Appendix A2 Water Usage Calculator.

A2 | Water Usage Calculator

breglobal

Job no: Date: 1 Assessor name: Registration no: Development name: 5B Pri

20-S011 10/12/2020 N/A 5B Prince Arthur Road

WATER EFFICI	ENCY CALCU	LATOR	RFORM		VELLIN	GS - (B.	ASIC C	ALCUL	ATOR)												
	House Type:	Тур	be 1	Тур	pe 2	Тур	e 3	Тур	be 4	Ту	pe 5	Тур	pe 6	Тур	e 7	Тур	be 8	Тур	be 9	Тур	e 10
	Description:	Туріса	al Unit																		
Installation Type	Unit of measure	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person day																
Is a dual or single flu	ush WC specified?	Du	ual	Select	option:	Click to	Select	Click to	Select	Click to	Select										
	Full flush volume	6	8.76		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
wc	Part flush volume	3	8.88		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	3	6.32		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Are both a Bath 8	Shower Present?	Bath &	Shower	Select	option:	Select	option:														
Bath	Capacity to overflow	180	19.80		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Shower	Flow rate (litres / minute)	8	34.96		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Kitchen sink taps	Flow rate (litres / minute)	4	12.12		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a washing machir	ne been specified?	Ye	es	Select option:		Select option:															
Washing Machine	Litres / kg	8.17	17.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a dishwash	er been specified?	Ye	es	Select	option:	Select	option:														
Dishwasher	Litres / place setting	1.25	4.50		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a waste	disposal unit been specified?	No	0.00	Select option:	0.00																
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Calcu	lated Use	112.5		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	Normalisat	ion factor	0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91
Code for	Total Consun	nption	102.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
Sustainable Homes	Mandatory	level	Level 3/4		-		-		-		-		-		-		-		-		-
	External u	ise	5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0
Building Regulations 17.K	Total Consur	nption	107.4		0.0		0.0		0.0		0.0	1	0.0		0.0		0.0		0.0		0.0
Regulations II.R	17.K Compli	ance?	Yes		-		-		-		-		-		-		-		-		-

(BASIC CALC.)

CSH Wat tool May 09

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Appendix A3 DER/TER Worksheets.

A3 | DER/TER Worksheets

DER WorkSheet: New dwelling design stage

		User Details:				
Assessor Name:		Stroma Nu	mber:			
Software Name:	Stroma FSAP 2012	Software V	ersion:	Versio	n: 1.0.5.12	
	Pro	operty Address: 5B P	rince Arthur Ro	ad_Be Lear		
Address :						
1. Overall dwelling dim	ensions:					
		Area(m ²)	Av. Height(<u> </u>	Volume(m ³	<u> </u>
Basement		176.5 (1a) >	3.1	(2a) =	547.15	(3a
Ground floor		150 (1b) >	3.1	(2b) =	465	(3b
First floor		134 (1c) x	2.7	(2c) =	361.8	(3c
Second floor		100 (1d) >	2.5	(2d) =	250	(3d
Third floor		45.7 (1e) >	2.45	(2e) =	111.97	(3e
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)	606.2 (4)				
Dwelling volume		(3a)+	(3b)+(3c)+(3d)+(3e)	+(3n) =	1735.91	(5)
2. Ventilation rate:						
	main secondary heating heating	other	total	_	m ³ per hou	r
Number of chimneys		+ 0 =	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0	x 20 =	0	(6b)
Number of intermittent f	ans		0	x 10 =	0	(7a)
Number of passive vent	s		0	x 10 =	0	(7b)
Number of flueless gas	fires		0	x 40 =	0	(7c)
				Air ch	anges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7a	1)+(7b)+(7c) =	0	+ (5) =	0	 (8)
	been carried out or is intended, proceed		-	(-)	0	
Number of storeys in	the dwelling (ns)			1	0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timber frame or 0	0.35 for masonry con	struction	i	0	(11)
if both types of wall are deducting areas of open	present, use the value corresponding to t	the greater wall area (after				_
	floor, enter 0.2 (unsealed) or 0.1	I (sealed), else enter	0	1	0	(12)
	nter 0.05, else enter 0				0	(13)
Percentage of window	vs and doors draught stripped				0	(14
Window infiltration		0.25 - [0.2 x (14)	+ 100] =	ĺ	0	(15)
Infiltration rate		(8) + (10) + (11) -	+ (12) + (13) + (15)	-	0	(16
Air permeability value	, q50, expressed in cubic metres	per hour per square	metre of envelo	ope area	3	(17
	ility value, then (18) = [(17) + 20]+(8)			İ	0.15	(18
	ies if a pressurisation test has been done	or a degree air permeabil	lity is being used			_
Number of sides shelter Shelter factor	ed				2	(19)
Infiltration rate incorpora		(20) = 1 - [0.075 : (21) = (18) x (20)			0.85	(20)

DER WorkSheet: New dwelling design stage

1		modifie		<u> </u>	<u> </u>		1.1	A	0	0.1		D .	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(22)m=	5.1	ge wind	speed fi 4.9	om Tabl	e / 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)111-	5.1	5	4.9	4.4	4.3	3.0	3.0	3.7	4	4.3	4.5	4.7]	
Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjust	od infiltr	- ation rat	o (ollowi	na for cl	oltor on	d wind a	nood) -	: (21a) x	(22a)m					
Adjuste		0.16	e (allow	0.14	0.14	0.12	0.12	0.12	(22a)m 0.13	0.14	0.14	0.15	1	
Calcula				rate for t				0.12	0.10	0.14	0.14	0.10]	
		al ventila											0.5	(23a
								N5)), othe) = (23a)			0.5	(23b
					-			n Table 4h					73.1	(23c)
							<u> </u>		<u> </u>			1 – (23c)) ÷ 100]	
(24a)m=		0.29	0.29	0.27	0.27	0.26	0.26	0.25	0.26	0.27	0.28	0.28]	(24a
· · .							<u> </u>	MV) (24b	ŕ	· ` `	<u> </u>		1	
(24b)m=		0	0	0	0	0	0	0	0	0	0	0]	(24b
								c) = (22t)		E (00)				
(24c)m=		0	0	0	0) - (23L), outer	vise (24	0 - (221	0	0	0	0		(24c
								on from I	<u> </u>		0]	(240
								0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effec	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	ld) in box	(25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.26	0.26	0.25	0.26	0.27	0.28	0.28]	(25)
3. He	at losse	s and he	eat loss (paramet	er:									
ELEN	IENT	Gros		Openin	gs	Net Ar		U-valu		AXU		k-value		AXk
_		area	(m²)	n	1 ²	A ,r		W/m2	_	(W/	K)	kJ/m²·l	ĸ	kJ/K
Doors	_					2.4	×	1	=	2.4				(26)
	ws Type					41.9	×1	/[1/(1.3)+	0.04] =	51.78				(27)
Windo	ws Type					48.7	x1	/[1/(1.3)+	0.04] =	60.18				(27)
														(27)
	ws Type					3.2	x1	/[1/(1.3)+	0.04] =	3.95				
Windo	ws Type					3.2	x1	/[1/(1.3)+	0.04] =	3.95 6.43				(27)
Windo	ws Type						x1		0.04] =					
Windo Rooflig	ws Type					5.2	×1	/[1/(1.3)+	0.04] =	6.43				
Windo Rooflig Floor	ws Type ghts		.7	101.	4	5.2	x1 x1	/[1/(1.3)+ /[1/(1.3) +	0.04] = 0.04] =	6.43 14.69				(27b
Windov Rooflig Floor Walls ⊺	ws Type ghts Type1	e 4		101,	4	5.2 11.3 176.5	x1 x1	/[1/(1.3)+ /[1/(1.3) + 0.1	0.04] =	6.43 14.69 17.65				(27b
	ws Type ghts Type1 Type2	≥ 4 		_	4	5.2 11.3 176.5 317.3	x1 x1 5 x	/[1/(1.3)+ /[1/(1.3) + 0.1 0.15	0.04] = 0.04] = = =	6.43 14.69 17.65 47.6				(27b (28) (29)
Windo Rooflig Floor Walls 1 Walls 1	ws Type ghts Type1 Type2 Type3	418	3	0		5.2 11.3 176.5 317.3 79	x1 5 x 8 x 8 x	/[1/(1.3)+ /[1/(1.3) + 0.1 0.15 0.14	0.04] = 0.04] = = = = =	6.43 14.69 17.65 47.6 11.02				(27b (28) (29) (29)
Windov Rooflig Floor Walls 1 Walls 1 Walls 1	ws Type ghts Type1 Type2 Type3 Type1	418 418 79 66.3	3	0		5.2 11.3 176.5 317.3 79 66.3	x1 5 x 8 x 8 x	/[1/(1.3)+ /[1/(1.3) + 0.1 0.15 0.14 0.15	0.04] = 0.04] = = = = = = = =	6.43 14.69 17.65 47.6 11.02 9.95				(27b (28) (29) (29) (29)

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5B PRINCE ARTHUR ROAD HAMPSTEAD

DER WorkSheet: New dwelling design stage

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04 ** include the areas on both sides of internal walls and partitions (26)...(30) + (32) = ((25)...(30) + (32) + (32a)...(32e) = (125)...(30) + (32) + (32a)...(32e) = (134)...(32e) + (32a)...(32e) = (134)...(32e) + (32a)...(32e) ..(32e) + (32a)...(32e) + (32a)...(32e) + ((26)...(30) + (32) = Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 47.6 (36) if details of thermal bridging are not known (36) = 0.05 x (31) 298.46 (37) (33) + (36) = Total fabric heat loss Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x Jan Peb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 88me 170.17 168.35 166.52 157.39 155.57 146.44 146.41 150.09 155.57 159.22 162.87 Heat transfer coefficient, W/K Heat transfer coefficient, W/K (30)m = (37) + (38)m (39)m= 468.64 466.81 464.98 455.85 454.03 444.9 443.07 448.55 457.68 461.33 Weat master coefficient, W/K Coefficient, W/K Coefficient, W/K 468.61 466.81 464.98 455.85 454.03 444.9 443.07 448.55 456.03 461.33 Weat loss parameter (HLP), W/m³K (40)m = (39)m + (4) Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in liftres per day for each month V/Lm = factor from Table 1c x (43) Feb Nov Dec Feb Nov Dec Feb Nov Dec Feb Nov Dec Feb Feb Feb Nov Dec Feb If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (d)min 28.88 25.26 26.07 22.73 21.81 18.82 17.44 20.01 20.25 23.6 25.76 27.97 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 250 If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.95 0.54 Temperature factor from Table 2b

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DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/vear (43) x (49) = 1.05 (50) b) If manufacturer's declared cylinder loss factor is not known: 0 (51) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53))
Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2 a 0 (52)	
If community heating see section 4.3 Volume factor from Table 2a 0 (52))
(·
Temperature factor from Table 2b 0 (53)	
)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54)	
Enter (50) or (54) in (55) 1.05 (55))
Water storage loss calculated for each month ((56)m = (55) × (41)m	
(56)m= 32.64 29.48 32.64 31.59 32.64 31.59 32.64 31.59 32.64 32.64 31.59 32.64 (56))
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.64 29.48 32.64 31.59 32.64 31.59 32.64 31.59 32.64 31.59 32.64 (57))
Primary circuit loss (annual) from Table 3 0 (58))
Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 23.26 23.26 (59))
Combi loss calculated for each month (61)m = (60) + 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (61))
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m	
(62)m= 248.46 218.9 229.69 205.61 201.28 179.55 172.15 189.3 189.09 213.22 225.82 242.38 (62)	5
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (63))
Output from water heater	
(64)m= 248.46 218.9 229.69 205.61 201.28 179.55 172.15 189.3 189.09 213.22 225.82 242.38	
Output from water heater (annual):)
Heat gains from water heating, kWh/month 0.25 ' [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 108.75 96.39 102.51 93.66 93.06 84.99 83.38 89.08 88.16 97.03 100.38 106.73 (65))
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 176.5 (66))
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 61.21 54.37 44.21 33.47 25.02 21.12 22.83 29.67 39.82 50.56 59.01 62.91 (67))
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 675.49 682.5 664.84 627.24 579.77 535.15 505.35 498.34 516 553.61 601.08 645.69 (68))
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 40.65 40.65 40.65 40.65 40.65 40.65 40.65 40.65 40.65 40.65 40.65 (69))
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 (70))
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 -141.2 (71))



DER WorkSheet: New dwelling design stage

DER WorkSheet: New dwelling design stage

DER WorkSheet: New dwelling design stage

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 0.77
 0.53
 0.36
 0.41
 0.71
 0.98
 1
 1

72)m=	146.17	gains (T 143.44	137.3	. /	130.08	125.08	1	18.04 112.06	119	.73 122.45	130.4	2 139.41	143.45	1	(72)
1		gains =					1.			3)m + (69)m + (1	1
73)m=	961.82	959.26	925.	78	869.74	808.82	7	53.27 719.19	726		813.5		931	1	(73)
· · ·	ar gains			-			1 ·								
			using s	olar	flux from T	able 6a	and	associated equa	tions	to convert to th	e applio	able orientat	ion.		
Orienta	tion: A	Access F	actor		Area			Flux		g		FF		Gains	
	٦	able 6d			m²			Table 6a		Table 6b		Table 6c		(W)	
Vorthea	st 0.9x	0.77		x	3.2		x	11.28	x	0.63	×	0.7	=	11.03	(75)
Vorthea	st 0.9x	0.77		x	3.2		×	22.97	×	0.63	×	0.7	=	22.46	(75)
Northea	st 0.9x	0.77		x	3.2		x	41.38	×	0.63	×	0.7	=	40.47	(75)
lorthea	st 0.9x	0.77		x	3.2		×	67.96	×	0.63	×	0.7	=	66.46	(75)
Northea		0.77		x	3.2		x	91.35	x	0.63	×	0.7	=	89.33	(75)
Northea	st <mark>0.9x</mark>	0.77		x	3.2		x	97.38	x	0.63	×	0.7	=	95.24	(75)
Northea	st 0.9x	0.77		x	3.2		×	91.1	×	0.63	×	0.7	=	89.09	(75)
Northea	L	0.77		x	3.2		x	72.63	×	0.63	×	0.7	=	71.03	(75)
Vorthea	st 0.9x	0.77		x	3.2		×	50.42	×	0.63	×	0.7	=	49.31	(75)
Northea	st 0.9x	0.77		x	3.2		x	28.07	x	0.63	×	0.7	-	27.45	(75)
lorthea	st 0.9x	0.77		x	3.2		x	14.2	×	0.63	×	0.7	=	13.88	(75)
lorthea		0.77		x	3.2		x	9.21	×	0.63	×	0.7	-	9.01	(75)
Southea	ist <mark>0.9x</mark>	0.77		x	48.7		×	36.79	×	0.63	×	0.7	-	547.62	(77)
Southea	ist <mark>0.9x</mark>	0.77		x	48.7		×	62.67	x	0.63	×	0.7	=	932.79	(77)
Southea	ist 0.9x	0.77		x	48.7		x	85.75	x	0.63	×	0.7	=	1276.29	(77)
Southea		0.77		x	48.7		×	106.25	×	0.63	×	0.7	=	1581.38	(77)
Southea	L	0.77		x	48.7		x	119.01	×	0.63	×	0.7	=	1771.28	(77)
Southea		0.77		x	48.7		x	118.15	×	0.63	×	0.7	=	1758.47	(77)
Southea		0.77		x	48.7		×	113.91	x	0.63	×	0.7	=	1695.35	(77)
Southea		0.77		x	48.7		×	104.39	x	0.63	×	0.7	=	1553.68	(77)
Southea		0.77		x	48.7		×	92.85	x	0.63	×	0.7	=	1381.95	(77)
Southea	L	0.77		x	48.7		×	69.27	×	0.63	×	0.7	=	1030.93	(77)
Southea	5	0.77		x	48.7		×	44.07	×	0.63	×	0.7	=	655.92	(77)
Southea		0.77		x	48.7		×	31.49	×	0.63	×	0.7	=	468.64	(77)
Southwe		0.77		x	41.9		×	36.79		0.63	×	0.7	=	471.15	(79)
Southwe	L	0.77		x	5.2		×	36.79		0.63	×	0.7	=	58.47	(79)
Southwe	L	0.77		x	41.9		×	62.67		0.63	×	0.7	=	802.55	(79)
Southwe	L	0.77		x	5.2		×	62.67		0.63	×	0.7	=	99.6	(79)
Southwe	5	0.77		x	41.9		×	85.75		0.63	×	0.7	=	1098.08	(79)
Southwe	<u>-</u>	0.77		x	5.2		×	85.75		0.63	×	0.7	=	136.28	(79)
Southwe	L	0.77		x	41.9		×	106.25		0.63	×	0.7	=	1360.57	(79)
Southwe	est <mark>0.9x</mark>	0.77		x	5.2		x	106.25		0.63	×	0.7	-	168.85	(79)

Southwest0.9x	0.77	×	41.9	×	11	9.01	1	0.63	×	0.7	=	1523.95	(79)
Southwest0.9x	0.77	×	5.2	×	11	9.01	1	0.63	×	0.7		189.13	(79)
Southwest0.9x	0.77	×	41.9	×	11	8.15	1	0.63	×	0.7		1512.93	(79)
Southwest0.9x	0.77	×	5.2	×	11	8.15	1	0.63	×	0.7		187.76	(79)
Southwest0.9x	0.77	×	41.9	×	11	3.91	1	0.63	x	0.7		1458.63	(79)
Southwest0.9x	0.77	×	5.2	×	11	3.91]	0.63	x	0.7	-	181.02	(79)
Southwest0.9x	0.77	×	41.9	×	10	4.39]	0.63	x	0.7	=	1336.74	(79)
Southwest0.9x	0.77	×	5.2	×	10	4.39]	0.63	x	0.7	=	165.9	(79)
Southwest0.9x	0.77	×	41.9	×	92	2.85]	0.63	x [0.7	=	1188.99	(79)
Southwest0.9x	0.77	×	5.2	×	92	2.85]	0.63	x [0.7	=	147.56	(79)
Southwest0.9x	0.77	×	41.9	×	69	9.27]	0.63	x	0.7	=	886.98	(79)
Southwest0.9x	0.77	×	5.2	×	69	9.27]	0.63	x	0.7	=	110.08	(79)
Southwest0.9x	0.77	×	41.9	×	44	1.07]	0.63	x	0.7	=	564.33	(79)
Southwest0.9x	0.77	×	5.2	×	44	1.07]	0.63	x	0.7	=	70.04	(79)
Southwest0.9x	0.77	×	41.9	×	31	1.49]	0.63	x	0.7	=	403.21	(79)
Southwest0.9x	0.77	×	5.2	×	31	1.49]	0.63	x	0.7	=	50.04	(79)
Rooflights 0.9x	1	×	11.3	×		26	×	0.3	x	0.7	=	55.53	(82)
Rooflights 0.9x	1	×	11.3	×		54	x	0.3	x	0.7	=	115.33	(82)
Rooflights 0.9x	1	×	11.3	×		96	x	0.3	x	0.7	- 1	205.03	(82)
Rooflights 0.9x	1	×	11.3	×	1	50] ×	0.3	x	0.7	=	320.36	(82)
Rooflights 0.9x	1	×	11.3	x	1	92	x	0.3	x	0.7	-	410.05	(82)
Rooflights 0.9x	1	×	11.3	×	2	00	×	0.3	x	0.7		427.14	(82)
Rooflights 0.9x	1	×	11.3	×	1	89	×	0.3	x	0.7	=	403.65	(82)
Rooflights 0.9x	1	×	11.3	×		57	×	0.3	x	0.7	=	335.3	(82)
Rooflights 0.9x	1	×	11.3	×	1	15	×	0.3	x	0.7	=	245.61	(82)
Rooflights 0.9x	1	×	11.3	×		66	×	0.3	x	0.7	=	140.96	(82)
Rooflights 0.9x	1	×	11.3	×		33	×	0.3	x	0.7	=	70.48	(82)
Rooflights 0.9x	1	×	11.3	×		21	×	0.3	x	0.7	=	44.85	(82)
Solar gains in							_	n = Sum(74)m	(82)m			,	
(83)m= 1143.8	1972.73 2756		3497.62 3983.7			3827.74	346	2.65 3013.41	2196.	4 1374.65	975.75		(83)
Total gains – ir		_	. , . ,	<u>`</u>								1	
(84)m= 2105.62	2931.98 3681	1.92	4367.36 4792.5	7 4	734.81	4546.93	418	9.33 3770.63	3009.9	4 2253.1	1906.75	J	(84)
7. Mean interr	nal temperati	ure (heating seaso	on)									
Temperature	during heatir	ng p	eriods in the li	ving	area fi	rom Tal	ble 9	, Th1 (°C)				21	(85)

ilisation factor for gains for living area, h1,m (see Table 9a)

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

 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

 (87)m=
 20.25
 20.39
 20.58
 20.79
 20.92
 20.96
 20.96
 20.96
 20.94
 20.74
 20.45
 20.23

 20.28

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Moor	intorno	Itomnor	atura (fa	or the wh	olo dwol	lling) = f	I A v T1	± /1 fl	A) x T2					
12)m=		19.68	19.93	20.22	20.38	20.43	20.43	20.43	20.41	20.16	19.76	19.47		(92)
				internal							18.70	10.47		(02)
4ppi) 3)m=	í – í – –	19.53	19.78	20.07	20.23	20.28	20.28	20.28	20.26	20.01	19.61	19.32		(93)
· ·	ace hea				20.20	20.20	20.20	20.20	20.20	20.01	10.01	10.02		(00)
		- × · ·		nperatur	ro obtoin	od at at	on 11 of	Table 0	o co tha	t Ti m=('	76)m on	d ro oolo	ulata	
				using Ta		eu ai si	epiroi	Table 5	J, SO IIIA	it 11,111–(n o)in an	u re=caic	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jtilis	ation fac	tor for g	ains, hm											
4)m=	1	1	0.99	0.93	0.77	0.53	0.36	0.41	0.71	0.97	1	1		(94)
Jsefi	ul gains,	hmGm	W = (94	4)m x (84	4)m									
5)m=	2105.3	2927.52	3642.18	4077.55	3677.85	2513.35	1636.03	1717.91	2678.29	2933.78	2251.34	1906.61		(95)
Mont	hly aver	age exte	rnal tem	perature	e from Ta	able 8								
6)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm,W:	=[(39)m	x [(93)m	(96)m]				
7)m=	7045.04	6827.39	6174.74	5093.25	3872.88	2525.34	1636.63	1719.39	2761.83	4273.26	5727.06	6974.14		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Vh/mon	th = 0.02	4 x [(97)m – (95)m] x (4 ⁻	1)m			
B)m=	3675.17	2620.71	1884.22	731.3	145.11	0	0 -	0	0	996.58	2502.52	3770.24		
		_			_			Tota	l per year	(kWh/year) = Sum(9	8)15.912 =	16325.84	(98)
Snac	e heatin	a require	ement in	kWh/m ²	/vear								26.93	 (99)
<u> </u>		· ·			.,									
	pace co		luiremer											_
Jaici					0	1. 401								
			July and	August.			Int	Aug	Son	Oct	Nev	Dee	ľ	
Inot	Jan	Feb	July and Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	loss rate	Feb	July and Mar	August.	May	Jun nal tem	perature	and exte			e from T			(100
00)m:	loss rate	Feb ELm (ca	July and Mar Iculated 0	August. Apr using 25	May 5°C inter	Jun			ernal ter	nperatur		able 10)		(100
00)m: Jtilis	loss rate 0 ation fac	Feb ELm (ca	July and Mar Iculated 0	August. Apr using 25	May 5°C inter	Jun nal tem	perature	and exte	ernal ter	nperatur	e from T	able 10)		
00)m: Jtilis 01)m:	loss rate 0 ation fac	Feb e Lm (ca 0 tor for lo	Uuly and Mar Iculated 0 oss hm 0	August. Apr using 25 0	May 5°C inter 0	Jun nal tem 4182.05 0.97	perature 3292.25	and exte 3367.35	ernal ten 0	nperatur 0	e from T 0	able 10) 0		
00)m: Jtilis 01)m: Jsefi	ation fac	Feb e Lm (ca 0 tor for lo	Uuly and Mar Iculated 0 oss hm 0	August. Apr using 25 0	May 5°C inter 0	Jun nal tem 4182.05 0.97	0.99	and exte 3367.35	ernal ten 0	nperatur 0	e from T 0	able 10) 0		(101
00)m Utilis 01)m Usefi 02)m	loss rate = 0 ation fac = 0 ul loss, h	Feb e Lm (ca o tor for lo 0 mLm (V 0	July and Mar Iculated 0 oss hm 0 /atts) = (0	August. Apr using 25 0 (100)m x	May 5°C inter 0 (101)m	Jun nal tem 4182.05 0.97 4054.47	0.99 3259.33	and exte 3367.35 0.98 3308.46	ernal ten 0 0	o 0 0	e from T 0 0	able 10) 0		(101
00)m Jtilis 01)m Jsefi 02)m Gain	loss rate = 0 ation fac = 0 ul loss, h = 0 s (solar g	Feb e Lm (ca o tor for lo 0 mLm (V 0	July and Mar Iculated 0 oss hm 0 /atts) = (0	August. Apr using 25 0 (100)m x	May 5°C inter 0 (101)m	Jun nal tem 4182.05 0.97 4054.47	0.99 3259.33 3259.33 sgion, se	and exte 3367.35 0.98 3308.46 e Table	ernal ten 0 0	o 0 0	e from T 0 0	able 10) 0		(101 (102
00)m Jtilis 01)m Jsefi 02)m Gain Gain	loss rate = 0 = 0 = 0 ul loss, h = 0 s (solar g	Feb = Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0	July and Mar Iculated 0 SS hm 0 (atts) = (0 Iculated 0	August. Apr using 25 0 (100)m x 0 for appli 0	May 5°C inter 0 (101)m 0 cable we 0	Jun nal tem 4182.05 0.97 4054.47 eather re 5681.54	0.99 3259.33 259.53	and exte 3367.35 0.98 3308.46 e Table 5058.64	ernal ten 0 0 10) 0	0 0 0	0 0 0	able 10) 0 0	< (41)m	(101 (102
00)m Jtilis 01)m Jsefi 02)m Gain Gain 03)m	loss rate = 0 ation fac = 0 ul loss, h = 0 s (solar g = 0 ce cooling	Feb e Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0 g require	July and Mar Iculated 0 sss hm 0 (atts) = (0 Iculated 0 ement fo	August. Apr using 25 0 (100)m x 0 for appli	May 5°C inter 0 (101)m 0 cable we 0 whole o	Jun nal tem 4182.05 0.97 4054.47 eather re 5681.54	0.99 3259.33 259.53	and exte 3367.35 0.98 3308.46 e Table 5058.64	ernal ten 0 0 10) 0	0 0 0	0 0 0	able 10) 0 0	< (41)m	(101 (102
00)m Utilis 01)m Usefi 02)m Gain Gain 03)m Spac set (1	loss rate 0 ation fac 0 ul loss, h 0 s (solar g 0 s (solar g) s (solar g)) s (so	Feb e Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0 g require	July and Mar Iculated 0 sss hm 0 (atts) = (0 Iculated 0 ement fo	August. Apr using 25 0 (100)m x 0 for appli 0 r month,	May 5°C inter 0 (101)m 0 cable we 0 whole o	Jun nal tem 4182.05 0.97 4054.47 eather re 5681.54	0.99 3259.33 259.53	and exte 3367.35 0.98 3308.46 e Table 5058.64	ernal ten 0 0 10) 0	0 0 0	0 0 0	able 10) 0 0	< (41)m	(101 (102
00)m Utilis 01)m Usefi 02)m Gain Gain 03)m Spac set (1	loss rate 0 ation fac 0 ul loss, h 0 s (solar g 0 s (solar g) s (solar g)) s (so	Feb Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0 grequire zero if (luly and Mar lculated 0 wss hm 0 /atts) = (0 lculated 0 cunent fo 104)m <	August. Apr using 25 0 (100)m × (100)m × 0 for appli 0 r month, : 3 × (98	May 5°C inter 0 (101)m 0 cable we 0 whole o)m	Jun nal tem 4182.05 0.97 4054.47 eather re 5681.54 Welling,	0.99 3259.33 259.53 25459.53 2000, se	and exte 3367.35 0.98 3308.46 e Table 5058.64 bus (kW	ernal ten 0 0 10) 0 (h) = 0.0	0 0 0 24 x [(10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 102)m] ;	k (41)m 4110.57	(100 (101 (102 (103
00)m Utilis 01)m Usefi 02)m Gain Gain Gain Gain Spac set (* 04)m	loss rate 0 ation fac 0 ul loss, h 0 s (solar g 0 s (solar g) s (solar	Feb Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0	luly and Mar lculated 0 wss hm 0 /atts) = (0 lculated 0 cunent fo 104)m <	August. Apr using 25 0 (100)m × (100)m × 0 for appli 0 r month, : 3 × (98	May 5°C inter 0 (101)m 0 cable we 0 whole o)m	Jun nal tem 4182.05 0.97 4054.47 eather re 5681.54 Welling,	0.99 3259.33 259.53 25459.53 2000, se	and exte 3367.35 0.98 3308.46 e Table 5058.64 pus (kW	0 0 10) 0 10) 0 (h) = 0.0 Total	nperatur 0 0 0 24 x [(10	e from T 0 0 0 0 3) <i>m</i> – (' 0 10,4)	able 10) 0 0 102)m]; 0 =		(101 (102 (103

								i ota	i = Sum(104)	=	4110.57	(10
ractior	n							fC=	cooled	area + (-	4) =	0.98	(10
ency fa	actor (Ta	able 10b)					_					
0	0	0	0	0	0.25	0.25	0.25	0	0	0	0]	
						•		Tota	l = Sum	(104)	=	0	7(10
			ency factor (Table 10b	ency factor (Table 10b)	f C = ency factor (Table 10b) 0 0 0 0.25 0.25 0	f C = cooled ancy factor (Table 10b) 0 0 0 0 0.25 0.25 0 0	ency factor (Table 10b)	raction f C = cooled area + (4) = ency factor (Table 10b) 0 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0	raction f C = cooled area + (4) = 0.98 ancy factor (Table 10b) 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0				

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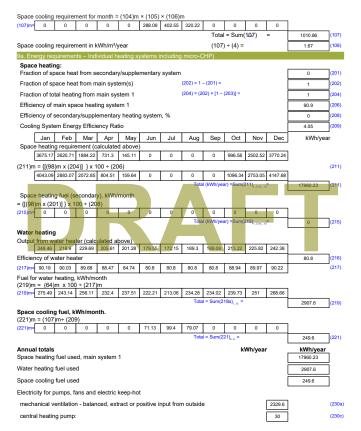
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26 | Sustainability and Energy Statement

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DER WorkSheet: New dwelling design stage



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DER WorkSheet: New dwelling design stage

Total electricity for the above, kWh/year	S	um of (230a)(230g) =	2359.6 (231)
Electricity for lighting			1081.01 (232)
12a. CO2 emissions - Individual heating system	s including micro-C	HP	
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	3879.41 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	628.04 (264)
Space and water heating	(261) + (262) + (263)	+ (264) =	4507.45 (265)
Space cooling	(221) x	0.519 =	129.54 (266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	1224.63 (267)
Electricity for lighting	(232) x	0.519 =	561.04 (268)
Total CO2, kg/year		sum of (265)(271) =	6422.66 (272)
Dwelling CO2 Emission Rate		(272) + (4) =	10.59 (273)
El rating (section 14)	_		87 (274)
DR		١F	Т

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TER WorkSheet: New dwelling design stage

Assessor Name: Software Name: Stror	na FSAP 2012	Stroma Nu Software \		Versio	n: 1.0.5.12	
	Pro	perty Address: 5B F	Prince Arthur Roa	id_Be Lear	ı	
Address :						
1. Overall dwelling dimensions:						
Basement		Area(m²)	Av. Height(n	1) (2a) =	Volume(m ³))](
						5
Ground floor		150 (1b)	3.1	(2b) =	465	
First floor		134 (1c) :	2.7	(2c) =	361.8	
Second floor		100 (1d)	2.5	(2d) =	250	٦
Third floor		45.7 (1e)	2.45	(2e) =	111.97	Ē
Total floor area TFA = (1a)+(1b)-	+(1c)+(1d)+(1c)+ (1c)					
	(10)+(10)+(10)+(11)					_
Dwelling volume		(3a)+	(3b)+(3c)+(3d)+(3e)+	·(3n) =	1735.91	
2. Ventilation rate:		other				
he	ain secondary ating heating		total		m ³ per hou	r
Number of chimneys	0 + 0	+ 0 =	0	x 40 =	0	1
Number of open flues	0 + 0	+ 0 =	0	x 20 =	0	٦
Number of intermittent fans			4	x 10 =	40	ī
Number of passive vents			0	x 10 =	0	╡
Number of flueless gas fires			0	x 40 =	0	4
Number of lideless gas lifes			0	×40 -	0	
				Air ch	anges per ho	ur
Infiltration due to chimneys, flues	and fans = (6a)+(6b)+(7a)	+(7b)+(7c) =	40	+ (5) =	0.02	٦
If a pressurisation test has been carrie			e from (9) to (16)			_
Number of storeys in the dwell	ing (ns)				0	
Additional infiltration			[(9)-1]x0.1 =	0	
Structural infiltration: 0.25 for s					0	(
if both types of wall are present, us deducting areas of openings); if equ		ne greater wall area (afte	,			
If suspended wooden floor, en		(sealed), else enter	0		0	٦
If no draught lobby, enter 0.05	. ,	(<i>n</i>			0	۲
					0	۲
Percentage of windows and do	oors draught stripped					
Percentage of windows and do Window infiltration	oors draught stripped	0.25 - [0.2 x (14)	+ 100] =		0	
5	oors draught stripped		+ 100] = + (12) + (13) + (15) =		0	٦
Window infiltration	5 11	(8) + (10) + (11)	+ (12) + (13) + (15) =			-
Window infiltration Infiltration rate	pressed in cubic metres	(8) + (10) + (11) per hour per square	+ (12) + (13) + (15) =		0	
Window infiltration Infiltration rate Air permeability value, q50, ex If based on air permeability value Air permeability value applies if a pres	pressed in cubic metres e, then (18) = [(17) + 20]+(8).	(8) + (10) + (11) per hour per square otherwise (18) = (16)	+ (12) + (13) + (15) = metre of envelo		0	
Window infiltration Infiltration rate Air permeability value, q50, ex If based on air permeability value Air permeability value applies if a pres Number of sides sheltered	pressed in cubic metres e, then (18) = [(17) + 20]+(8).	(8) + (10) + (11) per hour per square otherwise (18) = (16) or a degree air permeable	+ (12) + (13) + (15) = metre of envelo lity is being used		0 5 0.27 2	
Window infiltration Infiltration rate Air permeability value, q50, ex If based on air permeability value Air permeability value applies if a pres	pressed in cubic metres p, then (18) = [(17) + 20]+(8), surisation test has been done	(8) + (10) + (11) per hour per square otherwise (18) = (16)	+ (12) + (13) + (15) = e metre of envelo lity is being used x (19)] =		0 5 0.27	

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TER WorkSheet: New dwelling design stage

Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Second second from Table 7 (22)me 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m + 4 (22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18 Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.3 0.29 0.28 0.25 0.22 0.21 0.21 0.25 0.26 0.27 Calculate effective air change rate for the applicable case if mechanical verillation: []</td If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m= 0 b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0.53 0.54 0.53 0.53 0.54 ELEMENT Gross area (m²) Openings m² Net Area A,m² U-value A X U k-value A X k W/m2K (W/K) kJ/m²-K kJ/K Doors Windows Type 1 Windows Type 1 419 x10(1, 1/2, 0.24) = 64.56 (27) Windows Type 2 43.7 x10(1, 1/2, 0.24) = 64.56 (27) Windows Type 3 3.2 x11(1, 1/2, 0.04) = 64.56 (27) Windows Type 4 5.2 x10(1, 1/2, 0.04) = 64.56 (27) Rooflights 11.3 x10(1, 1/2, 0.04) = 64.56 (27) Floor 11.3 x10(1, 1/2, 0.04) = 64.56 (27) Walls Type 1 418.7 101.4 317.3 x 0.16 = 57.11 (28) Walls Type 2 7.9 0 7.9 x 0.18 = 14.22 (28) Walls Type 3 66.3 0 66.3 x 0.18 = 11.93 (28) Roof Type 1 17.0.4 11.3 199.1 x 0.13 = 22.648 (3) Roof Type 2 40.5 0 40.5 (3) (3) Total area of elements, m² 695.4 (3) (3) (3)

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TER WorkSheet: New dwelling design stage

windows, use effective window U-value calculated using formula 1/I(1/U-value)+0.041 as

** includ	le the area	is on both	sides of in	nternal wal	ls and part	itions			-					
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				283.8	(33)
Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (32	?) + (32a).	.(32e) =	0	(34)
Therm	al mass	parame	ter (TMF	⊃ = Cm ∢	TFA) in	kJ/m²K			Indicat	tive Value:	Medium		250	(35)
				tails of the	constructi	on are not	known pr	ecisely the	indicative	values of	TMP in Tá	ble 1f		_
		ad of a det												_
			,	culated I	• •		<						47.6	(36)
	of therma abric he		are not kn	iown (36) =	= 0.05 x (3	1)			(33) +	(36) =			331.4	(37)
			alculator	d monthle	,						25)m x (5)		331.4	(37)
VOTUR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m=	311.51	310.53	309.58	305.09	304.26	300.35	300.35	299.63	301.85	304.26	305.95	307.73		(38)
				000.00	004.20	000.00	000.00	200.00				007.10]	()
		coefficier								= (37) + (3			1	
(39)m=	642.9	641.93	640.98	636.49	635.65	631.75	631.75	631.02	633.25	635.65	637.35	639.12		(39)
Heat lo	oss para	meter (H	HP) W	/m²K						Average = = (39)m +	Sum(39). (4)	.º/12=	636.49	(39)
(40)m=	1.06	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.05	1	
										verage =	Sum(40),	₁₂ /12=	1.05	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	t ina e ner	av reau	irement:								kWh/y	ear:	
		Ipancy, I		[1 - exp	(-0.0003	40 × (TF	A -13 0	2)1 + 0 0	013 x (1	FA -13	3.	53		(42)
	A £ 13.9		. 1.70 %	(I - cxp	(-0.0003	11 1 2 2	A-10.5	/2/] • 0.0		- IS.	3)			
			tor upor	no in litro										
								(25 x N)			118	3.04]	(43)
			hot water	usage by a	5% if the d	welling is	designed t			e target o	118	3.04]	(43)
		litres per p	hot water berson per	usage by : r day (all w	5% if the d ater use, h	welling is not and co	designed t (d)	ò achievé	a water us	-]	(43)
Hot wat	Jan	litres per p Feb	hot water person per Mar	usage by a rday (all w Apr	5% if the d ater use, h May	welling is not and col	designed t d) Jul	o achieve Aug		e target of Oct	118 Nov	Dec]	(43)
	Jan er usage i	litres per p Feb h litres per	hot water berson per Mar day for ea	usage by : r day (all w Apr ach month	5% if the d ater use, f May Vd,m = fa	welling is not and co Jun ctor from 1	designed t d) Jul Table 1c x	o achieve Aug (43)	a water us Sep	Oct	Nov	Dec]]	(43)
	Jan	litres per p Feb	hot water person per Mar	usage by a rday (all w Apr	5% if the d ater use, h May	welling is not and col	designed t d) Jul	o achieve Aug	a water us Sep 115.68	Oct 120.4	Nov 125.12	Dec 129.84]	
(44)m=	Jan ar usage ii 129.84	litres per p Feb n litres per 125.12	hot water person per Mar day for ea 120.4	usage by : r day (all w Apr ach month	5% if the d ater use, h May Vd,m = fai 110.96	welling is not and co Jun ctor from 1 106.23	designed t d) Jul Fable 1c x 106.23	o achieve Aug (43) 110.96	a water us Sep 115.68	Oct 120.4 Total = Sur	Nov 125.12 m(44)1_12	Dec 129.84	1416.45	(43)
(44)m= Energy	Jan er usage in 129.84 content of	litres per p Feb n litres per 125.12 hot water	hot water person per day for ea 120.4 used - cal	usage by : r day (all w Apr ach month 115.68	5% if the d ater use, f May Vd,m = fai 110.96 onthly = 4.	welling is not and co Jun ctor from 1 106.23 190 x Vd,n	designed t (d) Table 1c x 106.23	o achieve Aug (43) 110.96)Tm / 3600	a water us Sep 115.68 kWh/mon	Oct 120.4 Total = Sun th (see Ta	Nov 125.12 m(44),	Dec 129.84 c, 1d)	1416.45	
(44)m= Energy	Jan ar usage ii 129.84	litres per p Feb n litres per 125.12	hot water person per Mar day for ea 120.4	usage by : r day (all w Apr ach month 115.68	5% if the d ater use, h May Vd,m = fai 110.96	welling is not and co Jun ctor from 1 106.23	designed t d) Jul Fable 1c x 106.23	o achieve Aug (43) 110.96	a water us Sep 115.68 kWh/mon 134.98	Oct 120.4 Total = Sun th (see Ta 157.31	Nov 125.12 n(44):2 = bles 1b, 1 171.72	Dec 129.84 c, 1d) 186.47		(44)
(44)m= Energy ((45)m=	Jan ar usage in 129.84 content of 192.55	litres per p Feb 125.12 hot water 168.41	hot water person per day for ea 120.4 used - cal 173.78	usage by : r day (all w Apr ach month 115.68	5% if the d ater use, h May Vd,m = fau 110.96 onthly = 4. 145.37	welling is o not and col Lun ctor from 1 106.23 190 x Vd,n 125.45	designed t d) Jul Fable 1c x 106.23 n x nm x E 116.24	Aug (43) 110.96 0Tm / 3600 133.39	a water us Sep 115.68 kWh/mon 134.98	Oct 120.4 Total = Sun th (see Ta 157.31	Nov 125.12 m(44),	Dec 129.84 c, 1d) 186.47	1416.45	
(44)m= Energy ((45)m= If instant	Jan ar usage in 129.84 content of 192.55	litres per p Feb 125.12 hot water 168.41	hot water person per day for ea 120.4 used - cal 173.78	usage by : r day (all w Apr ach month 115.68 culated mo 151.51	5% if the d ater use, h May Vd,m = fau 110.96 onthly = 4. 145.37	welling is o not and col stor from 1 106.23 190 x Vd,n 125.45	designed t d) Jul Fable 1c x 106.23 n x nm x E 116.24	Aug (43) 110.96 0Tm / 3600 133.39	a water us Sep 115.68 kWh/mon 134.98	Oct 120.4 Total = Sun th (see Ta 157.31	Nov 125.12 n(44):2 = bles 1b, 1 171.72	Dec 129.84 c, 1d) 186.47		(44)
(44)m= Energy ((45)m= If instant (46)m=	Jan er usage in 129.84 content of 192.55 taneous w	litres per p Feb n litres per 125.12 hot water 168.41 ater heatir 25.26	hot water person pei day for ea 120.4 used - cal 173.78 ng at point	usage by : r day (all w Apr ach month 115.68 iculated mo 151.51 t of use (no	5% if the d later use, t May Vd,m = fai 110.96 onthly = 4. 145.37 o hot water	welling is in tot and cou stor from 1 106.23 190 x Vd,n 125.45 storage),	designed t d) Jul fable 1c x 106.23 n x nm x E 116.24 enter 0 in	Aug (43) 110.96 17m / 3600 133.39 boxes (46)	a water us Sep 115.68 kWh/mon 134.98 to (61)	Oct 120.4 Total = Sun th (see Ta 157.31 Total = Sun	Nov 125.12 m(44) ₁₋₁₂ = bles 1b, 1 171.72 m(45) ₁₋₁₂ =	Dec 129.84 c, 1d) 186.47		(44) (45)
(44)m= Energy ((45)m= If instant (46)m= Water	Jan ar usage in 129.84 content of 192.55 taneous w 28.88 storage	litres per p Feb n litres per 125.12 hot water 168.41 ater heatir 25.26 loss:	hot water person per day for ee 120.4 used - cal 173.78 ng at point 26.07	usage by : r day (all w Apr ach month 115.68 iculated mo 151.51 t of use (no	5% if the d ater use, h May Vd,m = fai 110.96 onthly = 4. 145.37 o hot water 21.81	welling is of not and color ctor from 1 106.23 190 x Vd,n 125.45 storage), 18.82	designed t (d) Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44	Aug (43) 110.96 7 <i>m /</i> 3600 133.39 boxes (46) 20.01	Sep 115.68 134.98 10 (61) 20.25	Oct 120.4 Total = Sun 157.31 Total = Sun 23.6	Nov 125.12 m(44),2 biles 1b, 1 171.72 m(45),2 25.76	Dec 129.84 c, 1d) 186.47		(44) (45)
(44)m= Energy ((45)m= If instant (46)m= Water Storag If com	Jan ar usage in 129.84 content of 192.55 taneous w 28.88 storage e volum munity h	litres per p Feb n litres per 125.12 hot water 168.41 ater heatir 25.26 loss: e (litres) weating a	hot water person per Mar day for ee 120.4 used - cal 173.78 ng at point 26.07 i includir nd no ta	usage by s r day (all w Apr ach month 115.68 (culated mo 151.51 e of use (no 22.73 ng any so ank in dw	5% if the d ater use, h May Vd,m = fai 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e	welling is on and colored and	designed t d) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in	Aug (43) 110.96 (7 <i>m</i> / 3600 133.39 boxes (46) 20.01 within sa (47)	a water us Sep 115.68 <i>kWh/mon</i> 134.98 <i>to</i> (61) 20.25 ame vess	Oct 120.4 Total = Sur th (see Ta 157.31 Total = Sur 23.6 sel	Nov 125.12 m(44) ₁₋₁₂ = biles 1b, 1 171.72 m(45) ₁₋₁₂ = 25.76	Dec 129.84 c, 1d) 186.47 27.97		(44) (45) (46)
(44)m= Energy ((45)m= If instant (46)m= Water Storag If comi Otherv	Jan er usage in 129.84 content of 192.55 taneous w 28.88 storage e volum munity h vise if no	litres per p Feb n litres per 125.12 hot water 168.41 vater heatir 25.26 loss: e (litres) weating a p stored	hot water person per Mar day for ee 120.4 used - cal 173.78 ng at point 26.07 i includir nd no ta	usage by s r day (all w Apr ach month 115.68 (culated mo 151.51 t of use (no 22.73 ng any so	5% if the d ater use, h May Vd,m = fai 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e	welling is on and colored and	designed t d) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in	Aug (43) 110.96 (7 <i>m</i> / 3600 133.39 boxes (46) 20.01 within sa (47)	a water us Sep 115.68 <i>kWh/mon</i> 134.98 <i>to</i> (61) 20.25 ame vess	Oct 120.4 Total = Sur th (see Ta 157.31 Total = Sur 23.6 sel	Nov 125.12 m(44) ₁₋₁₂ = biles 1b, 1 171.72 m(45) ₁₋₁₂ = 25.76	Dec 129.84 c, 1d) 186.47 27.97		(44) (45) (46)
(44)m= Energy of (45)m= If instant (46)m= Water Storag If comit Otherv Water	Jan ar usage ii 129.84 content of 192.55 taneous w 28.88 storage e volum munity h vise if no storage	litres per p Feb n litres per 125.12 hot water 168.41 vater heatir 25.26 loss: e (litres) weating a o stored loss:	hot water person per day for ea 120.4 used - cal 173.78 ag at point 26.07 includir nd no ta hot wate	usage by : r day (all w Apr ach month 115.68 culated mo 151.51 t of use (no 22.73 ng any so ank in dw er (this in	5% if the d ater use, h May Vd,m = fau 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e scludes i	welling is of and and column ctor from 1 106.23 190 x Vd,n 125.45 storage), 18.82 WHRS nter 110 nstantar	designed t d) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in ieous co	Aug (43) 110.96 (7 <i>m</i> / 3600 133.39 boxes (46) 20.01 within sa (47)	a water us Sep 115.68 <i>kWh/mon</i> 134.98 <i>to</i> (61) 20.25 ame vess	Oct 120.4 Total = Sur th (see Ta 157.31 Total = Sur 23.6 sel	Nov 125.12 m(44), bles 1b, 1 171.72 m(45), 25.76 47)	Dec 129.84 c, 1d) 186.47 27.97 150		(44) (45) (46) (47)
(44)m= Energy ((45)m= If instant (46)m= Water Storag If comit Otherv Water a) If m	Jan ar usage ii 129.84 content of 192.55 taneous w 28.88 storage e volum munity h vise if no storage nanufact	litres per p Feb h litres per 125.12 hot water 168.41 25.26 loss: e (litres) eating a o stored loss: urer's de	hot water person per day for ea 120.4 used - cal 173.78 ag at point 26.07 i includir nd no ta hot wate	usage by : r day (all w Apr ach month 115.68 culated mo 151.51 c of use (no 22.73 ng any so ank in dw er (this in oss facto	5% if the d ater use, h May Vd,m = fau 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e scludes i	welling is of and and column ctor from 1 106.23 190 x Vd,n 125.45 storage), 18.82 WHRS nter 110 nstantar	designed t d) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in ieous co	Aug (43) 110.96 (7 <i>m</i> / 3600 133.39 boxes (46) 20.01 within sa (47)	a water us Sep 115.68 <i>kWh/mon</i> 134.98 <i>to</i> (61) 20.25 ame vess	Oct 120.4 Total = Sur th (see Ta 157.31 Total = Sur 23.6 sel	Nov 125.12 m(44) bles 1b, 1 171.72 m(45) 25.76 47) 1.	Dec 129.84 c, 1d) 186.47 27.97 150 89		(44) (45) (46) (47) (48)
(44)m= Energy ((45)m= If instant (46)m= Water Storag If comit Otherv Water a) If m	Jan ar usage ii 129.84 content of 192.55 taneous w 28.88 storage e volum munity h vise if no storage nanufact	litres per p Feb n litres per 125.12 hot water 168.41 vater heatir 25.26 loss: e (litres) weating a o stored loss:	hot water person per day for ea 120.4 used - cal 173.78 ag at point 26.07 i includir nd no ta hot wate	usage by : r day (all w Apr ach month 115.68 culated mo 151.51 c of use (no 22.73 ng any so ank in dw er (this in oss facto	5% if the d ater use, h May Vd,m = fau 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e scludes i	welling is of and and column ctor from 1 106.23 190 x Vd,n 125.45 storage), 18.82 WHRS nter 110 nstantar	designed t d) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in ieous co	Aug (43) 110.96 (7 <i>m</i> / 3600 133.39 boxes (46) 20.01 within sa (47)	a water us Sep 115.68 <i>kWh/mon</i> 134.98 <i>to</i> (61) 20.25 ame vess	Oct 120.4 Total = Sur th (see Ta 157.31 Total = Sur 23.6 sel	Nov 125.12 m(44), bles 1b, 1 171.72 m(45), 25.76 47)	Dec 129.84 c, 1d) 186.47 27.97 150 89		(44) (45) (46) (47)



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_														
	y lost fro nanufact					or in not		(48) x (49) =		1.	.02		(50)
	ater stor											0	1	(51)
	munity h	<u> </u>			(.,,				L	•	1	()
Volum	e factor	from Ta	ble 2a									0	1	(52)
Tempe	erature f	actor fro	m Table	2b								0]	(53)
Energ	y lost fro	m water	storage	, kWh/y	ear			(47) x (51) x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	55)								1.	.02		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64	1	(56)
lf cylind	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] + (5	0), else (5	7)m = (56)	m where	(H11) is fro	m Append	lix H	
(57)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64	1	(57)
Drimor	ry circuit	loce (or	nual) fr	m Tabl								0	1	(58)
	ry circuit					50)m = /	(58) + 36	5 x (41)	m		L	0	1	(00)
	dified by									r thermo	ostat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	1	(59)
Combi	i loss ca	oulated	for onch	month	(61)m =	(60) ± 26	SE v (41)m				I	1	
(61)m=	0	0		0	01)11-	00) + 30	0 0		0	0	0	0	1	(61)
		-		-	-	-	-						(50)	
	247.46	218	228.69		200.28	178.58	n montn 171.15	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m +	(61)m (62)
· · ·														(62)
	HW input of									r contribut	ion to wate	er heating)		
`		0		0		applies 0	, see Ap		>) 0	0	0	0	1	(63)
(63) m =				0	0	0	0		0	0	0	0		(63)
	t from w		-											
(64)m=	247.46	218	228.69	204.64	200.28	178.58	171.15	188.3	188.12	212.22	224.85	241.38	2503	67 (64)
											r (annual),			.67 (64)
	<u> </u>						(. /	(.)		K - 7	+ (57)m	()]	
(65)m=	107.95	95.67	101.71	92.88	92.26	84.22	82.58	88.28	87.39	96.23	99.6	105.93	l	(65)
inclu	ude (57)	m in cale	culation	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
66)m=	176.5	176.5	176.5	176.5	176.5	176.5	176.5	176.5	176.5	176.5	176.5	176.5		(66)
Lightin	ng gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5				-	
(67)m=	61.21	54.37	44.21	33.47	25.02	21.12	22.83	29.67	39.82	50.56	59.01	62.91	1	(67)
	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
Applia		682.5	664.84	627.24	579.77	535.15	505.35	498.34	516	553.61	601.08	645.69	1	(68)
	675.49						es 15e		e Table	5			1	
(68)m=		(calcula	ated in A	opendix	L equat	ion 15								
(68)m= Cookir	675.49 ng gains 40.65	(calcula 40.65	ted in A	opendix 40.65	L, equat 40.65	40.65	40.65	40.65	40.65	40.65	40.65	40.65	1	(69)
(68)m= Cookir (69)m=	ng gains 40.65	40.65	40.65	40.65	<u> </u>		-				40.65	40.65		(69)
(68)m= Cookir (69)m= Pumps	ng gains 40.65 s and far	40.65	40.65 (Table 5	40.65 5a)	40.65	40.65	40.65	40.65	40.65	40.65]	
(68)m= Cookir (69)m= Pumps (70)m=	ng gains 40.65 s and far 3	40.65 ns gains 3	40.65 (Table 5 3	40.65 5a) 3	40.65	40.65 3	-				40.65 3	40.65 3]	(69) (70)
(68)m= Cookir (69)m= Pumps (70)m=	ng gains 40.65 s and far	40.65 ns gains 3	40.65 (Table 5 3	40.65 5a) 3	40.65	40.65 3	40.65	40.65	40.65	40.65]]	

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(72)m=	heating	142.37	136.7	129.01	124.01	1	16.97 110.9	9 11	3.65	121.38	129.3	138.34	142.38	1	(7
· ·		gains =	100.7	120.01	124.01	1.						(71)m + (72)			
(73)m=	960.75	958.19	924.71	868.66	807.75	7	52.2 718.1		5.61	756.15	812.4		929.93	1	(7
· · ·	lar qain					1.		. 1						_	
			ising sola	r flux from	Table 6a	and	associated eq	uations	to co	nvert to the	e applic	able orientat	ion.		
Orienta	ation:	Access F	actor	Area			Flux			g		FF		Gains	
		Table 6d		m²			Table 6a		т	able 6b		Table 6c		(W)	
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	11.28	×		0.63	×	0.7	-	11.03	0
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	22.97	×		0.63	×	0.7	=	22.46	0
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	41.38	×		0.63	×	0.7		40.47	0
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	67.96	×		0.63	×	0.7		66.46	0
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	91.35	×		0.63	×	0.7	-	89.33	0
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	97.38	×		0.63	٦× ٦	0.7	=	95.24	1
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	91.1	×		0.63	×	0.7	-	89.09	0
Northea	ast <mark>0.9x</mark>	0.77	×	3.	2	x	72.63	×		0.63	×	0.7	=	71.03	(
Northea	ast <mark>0.9x</mark>	0.77	_ ×	3.	2	×	50.42	×		0.63	×	0.7	-	49.31	(
Northea	ast <mark>0.9x</mark>	0.77	×	-3.	2	x	28.07	7 ×		0.63	×	0.7	-	27.45	(
Northea	ast <mark>0.9</mark> x	0.77	×	3.	2	x	14.2	×		0.63	×	0.7	=	13.88	(
Northea	ast <mark>0.9</mark> x	0.77	×	3.	2	x	9.21	_ /×		0.63	×	0.7	=	9.01	(
Southe	ast <mark>0.9</mark> x	0.77	×	48	.7	x	36.79	×		0.63	×	0.7	-	547.62	(
Southe	ast <mark>0.9</mark> x	0.77	×	48	.7	x	62.67	×		0.63	x	0.7	=	932.79	0
Southe	ast 0.9x	0.77	×	48	.7	×	85.75	×		0.63	x	0.7	=	1276.29	(
Southe	ast <mark>0.9</mark> x	0.77	×	48	.7	x	106.25	×		0.63	×	0.7	=	1581.38	(
Southe	ast <mark>o.9x</mark>	0.77	×	48	.7	x	119.01	×		0.63	×	0.7	=	1771.28	(
Southe	ast <mark>o.9x</mark>	0.77	×	48	.7	x	118.15	×		0.63	×	0.7	=	1758.47	(
Southe	ast <mark>o.9x</mark>	0.77	×	48	.7	x	113.91	×		0.63	×	0.7	=	1695.35	(
Southe		0.77	×	48	.7	x	104.39	×		0.63	×	0.7	=	1553.68	(
Southe		0.77	×	48	.7	x	92.85	×		0.63	×	0.7	=	1381.95	(
Southe	ast <mark>o.9</mark> x	0.77	×	48	.7	x	69.27	×		0.63	x	0.7	-	1030.93	(
Southe	ast <mark>o.9x</mark>	0.77	×	48	.7	x	44.07	×		0.63	×	0.7	=	655.92	(
Southe	ast <mark>0.9x</mark>	0.77	×	48	.7	x	31.49	×		0.63	×	0.7	=	468.64	(
Southw	vest <mark>0.9x</mark>	0.77	×	41	.9	x	36.79			0.63	×	0.7	=	471.15	(
Southw	vest <mark>o.9x</mark>	0.77	×	5.	2	x	36.79			0.63	x	0.7		58.47	0
Southw	vest <mark>o.9x</mark>	0.77	×	41	.9	x	62.67			0.63	x	0.7		802.55	0
Southw	vest <mark>o.9x</mark>	0.77	×	5.	2	x	62.67			0.63	x	0.7		99.6	0
Southw	vest <mark>o.9x</mark>	0.77	×	41	.9	x	85.75			0.63	x	0.7	=	1098.08	(
Southw	vest <mark>o.9x</mark>	0.77	×	5.	2	x	85.75			0.63	x	0.7	=	136.28	(
Southw	vest <mark>0.9x</mark>	0.77	×	41	.9	x	106.25	1		0.63	×	0.7	=	1360.57	0
Southw	esto.9x	0.77	Ξ.	5.	2		106.25	=		0.63	۲,	0.7	-	168.85	

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0		1		1		1		7		_		_
Southwest0.9x	0.77	x	41.9	×	119.01	1	0.63	×	0.7	=	1523.95	(79
Southwest0.9x	0.77	x	5.2	×	119.01		0.63	×	0.7	=	189.13	(79
Southwest0.9x	0.77	x	41.9	×	118.15		0.63	×	0.7	=	1512.93	(79
Southwest0.9x	0.77	x	5.2	x	118.15]	0.63	×	0.7	=	187.76	(79
Southwest0.9x	0.77	x	41.9	x	113.91]	0.63	×	0.7	=	1458.63	(79
Southwest0.9x	0.77	x	5.2	x	113.91]	0.63	×	0.7	=	181.02	(79
Southwest0.9x	0.77	x	41.9	x	104.39]	0.63	×	0.7	=	1336.74	(79
Southwest0.9x	0.77	x	5.2	x	104.39]	0.63	x	0.7	=	165.9	(79
Southwest _{0.9x}	0.77	x	41.9	x	92.85]	0.63	x	0.7	=	1188.99	(79
Southwest _{0.9x}	0.77	x	5.2	x	92.85]	0.63	x	0.7	=	147.56	(79
Southwest0.9x	0.77	x	41.9	x	69.27]	0.63	x	0.7	=	886.98	(79
Southwest _{0.9x}	0.77	x	5.2	x	69.27]	0.63	x	0.7	=	110.08	(79
Southwest0.9x	0.77	x	41.9	x	44.07]	0.63	x	0.7	=	564.33	(79
Southwest0.9x	0.77	x	5.2	x	44.07]	0.63	x	0.7	=	70.04	(79
Southwest0.9x	0.77	x	41.9	x	31.49]	0.63	x	0.7	=	403.21	(79
Southwest0.9x	0.77	x	5.2	x	31.49]	0.63	x	0.7	=	50.04	(79
Rooflights 0.9x	1	x	11.3	x	26	×	0.63	x	0.7	=	116.61	(82
Rooflights 0.9x	1	×	11.3	x	54	×	0.63	х	0.7	=	242.19	(82
Rooflights 0.9x	1	x	11.3	×	96	×	0.63	x	0.7		430.56	(82
Rooflights 0.9x	1	x	11.3	×	150	×	0.63	x	0.7	-	672.75	(82
Rooflights 0.9x	1	x	11.3	x	192	×	0.63	x	0.7	-	861.11	(82
Rooflights 0.9x	1	x	11.3	×	200	×	0.63	x	0.7	-	896.99	(82
Rooflights 0.9x	1	x	11.3	x	189	×	0.63	x	0.7	-	847.66	(82
Rooflights 0.9x	1	x	11.3	×	157	1 ×	0.63	x	0.7	=	704.14	 (82
Rooflights 0.9x	1	x	11.3	i x	115	1 ×	0.63	x	0.7	=	515.77	 (82
Rooflights 0.9x	1	x	11.3	į ×	66	ĺ×	0.63	x	0.7	=	296.01	(82
Rooflights 0.9x	1	x	11.3	į ×	33	i .	0.63	x	0.7	=	148	<mark>ار</mark> 82
Rooflights 0.9x	1	x	11.3	i .	21	i .	0.63	×	0.7	-	94.18	<mark>ار</mark> 82
						-		-				_
Solar gains in v				th		_	n = Sum(74)m				-	
	2099.59 298	1.67	3850.01 4434.8		451.4 4271.76		1.48 3283.57	2351.4	5 1452.17	1025.09	1	(83

(84)m=	2165.63	3057.77	3906.37	4718.67	5242.55	5203.59	4989.87	4557.09	4039.73	3163.92	2329.55	1955.02		(84)
7. Me	an inter	nal temp	oerature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area i	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)	_		_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	0.99	0.97	0.89	0.72	0.55	0.62	0.88	0.99	1	1	1	(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.65	19.85	20.15	20.51	20.8	20.96	20.99	20.98	20.87	20.45	19.97	19.62	1	(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
(88)m=	20.03	20.03	20.04	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.04	1	(88)

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TER WorkSheet: New dwelling design stage

39)m=	1	1	0.99	0.96	0.85	h2,m (se	0.43	0.5	0.81	0.99	1	1		(89)
												L .	l	()
		<u> </u>				ing T2 (f		<u> </u>		<u> </u>				(00)
90)m=	18.2	18.5	18.93	19.45	19.85	20.02	20.05	20.04	19.94	19.38	18.67	18.15		(90)
										LA = Livin	g area + (4) =	0.24	(91)
Mean	n interna	I temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
92)m=	18.55	18.83	19.23	19.71	20.08	20.25	20.28	20.27	20.16	19.64	18.99	18.51		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	re appro	opriate				
93)m=	18.55	18.83	19.23	19.71	20.08	20.25	20.28	20.27	20.16	19.64	18.99	18.51		(93)
8. Sp	ace hea	iting req	uirement											
						ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-cald	ulate	
the ut	tilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		, Š	ains, hm				-					-		
94)m=	1	1	0.99	0.96	0.85	0.66	0.46	0.53	0.82	0.98	1	1		(94)
		-	, W = (9-	/ \	<u> </u>									(05)
··· /	2164.91		3867.21		4460.1	3409.68	2303.03	2405.14	3321.79	3106.46	2326.8	1954.64		(95)
	ć	, <u> </u>	ernal terr	<u> </u>										(00)
96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	_					Lm , W :	<u> </u>			<u> </u>				(97)
	9163.69		8156.94				2322.5	2443.87	3839.52	57 <mark>45.26</mark>	7577.75	9145.41		(97)
	_					T)m – (95			50.40.00		
	5207.1	3957.8	ament fo 3191.56			Wh/mon	th = 0.02 0	0	0	1963.27	3780.68			
98)m=	5207.1	3957.8	3191.56	1708.16	644.66	T		0	0		3780.68		25803.16	(98)
98)m=	5207.1	3957.8		1708.16	644.66	T		0	0	1963.27	3780.68		25 <mark>803.16</mark> 42.57	(98) (99)
98)m= Space	5207.1 e heatin	3957.8	3191.56 ement in	1708.16 kWh/m ^a	644.66 /year	T	0	0 Tota	0 I per year	1963.27	3780.68			
98)m= Space 9a. En	5207.1 e heatin	3957.8 Ig require	3191.56 ement in	1708.16 kWh/m ^a	644.66 /year	0	0	0 Tota	0 I per year	1963.27	3780.68			
98)m= Space (a. En Spac	5207.1 e heatin lergy rec e heatin	3957.8 Ig requin quiremen ng:	3191.56 ement in hts – Ind	1708.16 kWh/m ^a ividual h	644.66 /year eating s	0	ncluding	0 Tota micro-C	0 I per year	1963.27	3780.68			
98)m= Space Ja. En Spac Fracti	5207.1 e heatin ergy rec e heatin ion of sp	3957.8 ng require quiremen ng: pace hea	3191.56 ement in hts – Ind	1708.16 kWh/m ² ividual h	644.66 /year eating s y/supple	0 ystems i	0 ncluding	0 Tota micro-C	0 I per year CHP)	1963.27	3780.68		42.57	(99)
98)m= Space (a. En Spac Fracti Fracti	5207.1 e heatin ergy rec e heatin ion of sp ion of sp	3957.8 g require guiremen ng: pace hea pace hea	3191.56 ement in hts – Ind at from s	kWh/m ² kWh/m ² widual h econdar nain syst	644.66 //year eating s y/supple em(s)	0 ystems i	0 ncluding system	0 Tota micro-C	0 I per year :HP) - (201) =	1963.27 (kWh/year	3780.68		42.57	(99)
98)m= Space Space Space Fracti Fracti Fracti	5207.1 e heatin ergy rec e heatin ion of sp ion of sp ion of to	3957.8 Ig require quiremen ng: bace hea bace hea bace heat	3191.56 ement in nts – Ind at from s at from m ng from	kWh/m ² kWh/m ² ividual h econdar nain syst main syst	644,66 //year eating s y/supple em(s) stem 1	0 ystems i	0 ncluding system	0 Tota micro-C (202) = 1	0 I per year :HP) - (201) =	1963.27 (kWh/year	3780.68		42.57 0 1	(99) (201) (202)
98)m= Space Space Space Fracti Fracti Fracti Efficie	5207.1 e heatin lergy rec the heatin ion of sp ion of sp ion of to ency of to	3957.8 ag require quiremen ng: bace hea bace hea bace hea tal heati main spa	3191.56 ement in hts – Ind at from s at from r ng from ace heat	kWh/m ² kWh/m ² widual h econdar main syst main syste	644,66 //year eating s y/supple em(s) stem 1 em 1	0 ystems i	0 ncluding r system	0 Tota micro-C (202) = 1	0 I per year :HP) - (201) =	1963.27 (kWh/year	3780.68		42.57 0 1 93.5	(99) (201) (202) (204) (206)
98)m= Space Space Space Fracti Fracti Fracti Efficie	5207.1 e heatin ergy rec e heatin ion of sp ion of to ency of to ency of to	3957.8 g requiremenng: pace heatipace heatipac	3191.56 ement in hts – Ind at from s at from m ng from ace heat rry/suppl	1708.16 kWh/m ² widual h econdar main syst main syst ing syste ementar	644.66 //year eating s y/supple em(s) stem 1 em 1 y heatin	o ystems i mentary g system	ncluding system	0 Tota (202) = 1 - (204) = (2	0 (per year - (201) = (202) × [1 - 1	1963.27 (kWh/year (203)] =	3780.68) = Sum(9	8)	42.57 0 1 93.5 0	(99) (201) (202) (204) (206) (208)
98)m= Space Space Fracti Fracti Fracti Efficie Efficie	spanning for the second	3957.8 g require quiremen ng: bace hea bace hea bace hea tal heati main spa seconda Feb	3191.56 ement in hts – Ind at from s at from r ng from ace heat rry/suppl Mar	kWh/m ² kWh/m ² widual h econdar main syst main syst ementar Apr	644,66 //year eating s y/supple em(s) stem 1 em 1 y heatin May	0 ystems i mentary g systen Jun	0 ncluding r system	0 Tota micro-C (202) = 1	0 I per year :HP) - (201) =	1963.27 (kWh/year	3780.68		42.57 0 1 93.5	(99) (201) (202) (204) (206) (208)
98)m= Space Space Fracti Fracti Fracti Efficie Efficie	s207.1 e heatin ion of sp ion of to ency of to ency of s Jan e heatin	3957.8 g require quiremenng: bace hea bace hea bace hea tal heati main spa seconda Feb g require	3191.56 ement in hts – Ind at from s at from r ng from ace heat ry/suppl Mar ement (c	kWh/m ² kWh/m ² widual h econdar main syst main syst ementar Apr alculate	644,66 //year eating s y/supple em(s) stem 1 em 1 y heatin May d above	0 ystems i mentary g systen Jun	ncluding system n, % Jul	0 Tota (202) = 1 (204) = (2 Aug	0 HP) -(201) = 02) × [1 -	1963.27 (kWh/year (203)] = Oct	3780.68) = Sum(9 Nov	8) = Dec	42.57 0 1 93.5 0	(99) (201) (202) (204) (206) (208)
98)m= Space Space Fracti Fracti Fracti Efficie Space	sport of spo	3957.8 g require quiremen ng: bace hea bace hea bac hea bace hea bace hea bace hea bace hea b	anglishes and an anglishes and at from shat from shat from shat from right acce heat anglishes and the shat from t	4708.16 kWh/m ² widual h econdar nain syst main syst ing syste ementar Apr alculate 1708.16	644,66 //year eating s //supple em(s) stem 1 em 1 y heatin May d above 644.66	0 ystems i mentary g systen Jun	ncluding system	0 Tota (202) = 1 - (204) = (2	0 (per year - (201) = (202) × [1 - 1	1963.27 (kWh/year (203)] =	3780.68) = Sum(9	8)	42.57 0 1 93.5 0	(99) (201) (202) (204) (206) (208) (208) year
98)m= Space Space Fracti Fracti Fracti Efficie Space	s207.1 e heatin iergy rec ie heatin ion of sp ion of sp ion of to ency of t ency of s Jan e heatin 5207.1 n = {[(98	3957.8 ag requin quiremen ng: bace heating tal heati	anglish and a second at from s at from s at from n ace heat ary/suppl Mar ement (c 3191.56 at)] } x 1	kWh/m ³ kWh/m ³ econdar hain syst main syst ementar Apr alculate 1708.16 00 + (20	644,66 //year eating s eating s em(s) stem 1 em 1 y heatin May d above 644.66)6)	0 ystems i ementary g system Jun) 0	ncluding system n, % Jul 0	0 Tota (202) = 1 - (204) = (2 Aug 0	0 per year - (201) = - (201) × [1 - - (202) × [1 -	1963.27 (kWh/year (203)] = Oct 1963.27	3780.68) = Sum(9) = Sum(9 Nov 3780.68	B) = Dec 5349.93	42.57 0 1 93.5 0	(99) (201) (202) (204) (206) (208)
98)m= Space Space Fracti Fracti Fracti Efficie Space	s207.1 e heatin iergy rec ie heatin ion of sp ion of sp ion of to ency of t ency of s Jan e heatin 5207.1 n = {[(98	3957.8 ag requin quiremen ng: bace heating tal heati	anglishes and an anglishes and at from shat from shat from shat from right acce heat anglishes and the shat from t	kWh/m ³ kWh/m ³ econdar hain syst main syst ementar Apr alculate 1708.16 00 + (20	644,66 //year eating s //supple em(s) stem 1 em 1 y heatin May d above 644.66	0 ystems i mentary g systen Jun	ncluding system n, % Jul	0 Tota (202) = 1 (204) = (2 Aug 0	0 per year HP) - (201) = 02) × [1 - 0 0	1963.27 (kWh/year (203)] = Oct 1963.27 2099.75	3780.68) = Sum(9 Nov 3780.68 4043.51	B) = Dec 5349.93 5721.86	42.57	(99) (201) (202) (204) (206) (208) year (211)
98)m= Space Space Fracti Fracti Fracti Efficie Space	s207.1 e heatin iergy rec ie heatin ion of sp ion of sp ion of to ency of t ency of s Jan e heatin 5207.1 n = {[(98	3957.8 ag requin quiremen ng: bace heating tal heati	anglish and a second at from s at from s at from n ace heat ary/suppl Mar ement (c 3191.56 at)] } x 1	kWh/m ³ kWh/m ³ econdar hain syst main syst ementar Apr alculate 1708.16 00 + (20	644,66 //year eating s eating s em(s) stem 1 em 1 y heatin May d above 644.66)6)	0 ystems i ementary g system Jun) 0	ncluding system n, % Jul 0	0 Tota (202) = 1 (204) = (2 Aug 0	0 per year HP) - (201) = 02) × [1 - 0 0	1963.27 (kWh/year (203)] = Oct 1963.27	3780.68) = Sum(9 Nov 3780.68 4043.51	B) = Dec 5349.93 5721.86	42.57 0 1 93.5 0	(99) (201) (202) (204) (206) (208) (208) year
Space Space Fracti Fracti Efficie Space 211)m Space	s207.1 e heatin ion of sp ion of to ency of i ency of i ency of s Jan e heatin 5207.1 n = {[(98 5569.09] e heatin	g require quiremen ng: pace hea pace hea pace hea tal heati main spa seconda Feb g require 3957.8 t)m x (20 4232.94	an ement in at from s at from s at from r ng from ace heat ary/suppl Mar ement (c 3191.56 (3191.56 (4)] } x 1 3413.44 we condar	kWh/m ² kWh/m ² widual h econdar, main syst ementar Apr alculater 1708.16 00 + (20 1826.91 y), kWh/	644.66 //year eating s //supple em(s) stem 1 em 1 y heatin May d above 644.66 06) 689.47	0 ystems i ementary g system Jun) 0	ncluding system n, % Jul 0	0 Tota (202) = 1 (204) = (2 Aug 0	0 per year HP) - (201) = 02) × [1 - 0 0	1963.27 (kWh/year (203)] = Oct 1963.27 2099.75	3780.68) = Sum(9 Nov 3780.68 4043.51	B) = Dec 5349.93 5721.86	42.57	(99) (201) (202) (204) (206) (208) year (211)
Space Space Space Fracti Fracti Efficie Space 211)rr Space 211(98	s207.1 e heatin ion of sp ion of to ency of i ency of i s207.1 n = {[[98 5569.09 e heatin } m x (20	3957.8 g requirement ng: bace heat bace heat ace he	an ement in the ment in the second at from second at from react from react from react from react from the second at 191.56 (3191.56) (3191.	1708.16 kWh/m ² widual h econdar nain syst main syst ementar Apr alculate 1708.16 00 + (20 1826.91 y), kWh/ 8)	644.66 2/year eating s y/supple em(s) stem 1 y heatin May d above 644.66 66) 689.47 month	0 ystems i mentary g system Jun) 0	ncluding system n, % Jul 0	0 Tota (202) = 1 - (204) = (2 Aug 0 Tota	0 per year HP) - (201) = 02) × [1 - 0 0	1963.27 (kWh/year (203)] = Oct 1963.27 2099.75 ar) =Sum(2	3780.68) = Sum(9 Nov 3780.68 4043.51	B) = Dec 5349.93 5721.86	42.57	(99) (201) (202) (204) (206) (208) year (211)
Space Space Fracti Fracti Efficie Space 211)m Space	s207.1 e heatin ion of sp ion of to ency of i ency of i s207.1 n = {[[98 5569.09 e heatin } m x (20	g require quiremen ng: pace hea pace hea pace hea tal heati main spa seconda Feb g require 3957.8 t)m x (20 4232.94	an ement in at from s at from s at from r ng from ace heat ary/suppl Mar ement (c 3191.56 (3191.56 (4)] } x 1 3413.44 we condar	kWh/m ² kWh/m ² widual h econdar, main syst ementar Apr alculater 1708.16 00 + (20 1826.91 y), kWh/	644.66 //year eating s //supple em(s) stem 1 em 1 y heatin May d above 644.66 06) 689.47	0 ystems i ementary g system Jun) 0	ncluding system n, % Jul 0	0 Tota (202) = 1 - (204) = (2 Aug 0 Tota 0	0 HP) -(201) = 22) × [1 0 0 1 (kWh/yes 0	1963.27 (kWh/year (203)] = Oct 1963.27 2099.75	Nov 3780.68) = Sum(9 3780.68 4043.51 11)	B) = Dec 5349.93 5721.86 = 0	42.57	(99) (201) (202) (204) (206) (208) year (211)

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TER WorkSheet: New dwelling design stage

Water heating

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Output	from w	ater hea	ter (calc	ulated at	oove)									
	247.46	218	228.69	204.64	200.28	178.58	171.15	188.3	188.12	212.22	224.85	241.38		_
	<u> </u>	ater hea											79.8	(216
(217)m=		89.87	89.7	89.22	87.71	79.8	79.8	79.8	79.8	89.33	89.82	89.98		(217
			kWh/me (217) + (217)											
(219)m=		242.57	254.96	229.37	228.34	223.79	214.47	235.96	235.74	237.56	250.33	268.26	1	
								Tota	l = Sum(2	19a) _{1_12} =			2896.45	(219
	I totals									k	Wh/yea	r	kWh/yea	r
Space	heating	fuel use	ed, main	system	1								27596.97	
Water	heating	fuel use	:d										2896.45	
Electric	city for p	oumps, fa	ans and	electric I	keep-ho	t								
centra	al heatir	ng pump	:									30		(23
boiler	with a f	an-assis	sted flue									45	ĺ	(23
Total e	lectricit	y for the	above, I	(Wh/yea	r			sum	of (230a).	(230g) =			75	(23
Electric	city for I	ighting											1081.01	(23
Space		(main s (second	ystem 1 dary))		kW (21 (21)	hergy /h/year 1) x 5) x 9) x			Emiss kg CO 0.2 0.5	16 19	tor = =	Emissions kg CO2/ye 5960.94 0 625.63	
Space	and wa	ter heati	ng			(26	1) + (262)	+ (263) + (264) =				6586.58	(26
Electric	city for p	oumps, fa	ans and	electric I	keep-ho	t (23	1) x			0.5	19	=	38.93	(26
Electric	city for I	ighting				(23)	2) x			0.5	19	=	561.04	(26
Total C	02, kg	year							sum o	f (265)(271) =		7186.54	(27
TER	=												11.86	(27

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DER WorkSheet: New dwelling design stage

Software Name:	Stroma FSAP 2012		• Version	-	ion: 1.0.5.12	
Address :	Prc	operty Address: 5	B Prince Art	hur Road_Be Gre	een	
1. Overall dwelling dime	ensions:					
		Area(m ²)	Av. H	leight(m)	Volume(m	3)
Basement		176.5 (14	a) x	3.1 (2a) =	547.15	(3
Ground floor		150 (11	o) x	3.1 (2b) =	465	(3
First floor		134 (10	;) x	2.7 (2c) =	361.8	-
Second floor		100 (10	i) x	2.5 (2d) =	250	(;
Third floor		45.7 (16	e) x	2.45 (2e) =	111.97	=
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	606.2 (4)				
Dwelling volume		(3	a)+(3b)+(3c)+(3d)+(3e)+(3n) =	1735.91	(
2. Ventilation rate:						_
	main secondary heating heating	other	tota		m ³ per hou	ır
Number of chimneys	0 + 0	+ 0	= 0	x 40 =	0	(
Number of open flues		* 0	= 0	x 20 =	0	(
Number of intermittent fa	ins		0	x 10 =	0	0
Number of passive vents			0	x 10 =	0	0
Number of flueless gas fi	ires		0	x 40 =	0	0
				Air c	hanges per h	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7a))+(7b)+(7c) =	0	+ (5) =	0	(8
	been carried out or is intended, proceed t	to (17), otherwise con	tinue from (9) t	o (16)		_
Number of storeys in t	ne dwelling (ns)			[(9)-1]x0.1 =	0	(9
						<u> </u>
Additional infiltration	25 for steel or timber frame or (35 for maconny	construction		0	-
Structural infiltration: 0 if both types of wall are p.	0.25 for steel or timber frame or 0 resent, use the value corresponding to th	,			0	-
Structural infiltration: 0 if both types of wall are p deducting areas of openin	resent, use the value corresponding to things); if equal user 0.35	he greater wall area (a	after		0]; _
Structural infiltration: 0 if both types of wall are p deducting areas of openii If suspended wooden	resent, use the value corresponding to th ings); if equal user 0.35 floor, enter 0.2 (unsealed) or 0.1	he greater wall area (a	after		0];];
Structural infiltration: 0 if both types of wall are p deducting areas of openii If suspended wooden i If no draught lobby, en	resent, use the value corresponding to things); if equal user 0.35 floor, enter 0.2 (unsealed) or 0.1 tter 0.05, else enter 0	he greater wall area (a	after		0	
Structural infiltration: 0 if both types of wall are p deducting areas of openin If suspended wooden 1 If no draught lobby, en Percentage of window	resent, use the value corresponding to th ings); if equal user 0.35 floor, enter 0.2 (unsealed) or 0.1	he greater wall area (a (sealed), else en	after ter 0		0 0 0	
Structural infiltration: 0 if both types of wall are p deducting areas of openii If suspended wooden 1 If no draught lobby, en Percentage of window Window infiltration	resent, use the value corresponding to things); if equal user 0.35 floor, enter 0.2 (unsealed) or 0.1 tter 0.05, else enter 0	he greater wall area (a (sealed), else en 0.25 - [0.2 x (after ter 0 (14) + 100] =		0 0 0 0	
Structural infiltration: 0 if both types of wall are p deducting areas of openin If suspended wooden 1 If no draught lobby, en Percentage of window Window infiltration Infiltration rate	resent, use the value corresponding to things); if equal user 0.35 floor, enter 0.2 (unsealed) or 0.1 tter 0.05, else enter 0	0.25 - [0.2 x ((8) + (10) + ()	after ter 0 [14) + 100] = [11) + (12) + (13	i) + (15) =	0 0 0	
Structural infiltration: 0 # both types of wall are p deducting areas of openia If suspended wooden 1 If no draught lobby, en Percentage of window Window infiltration Infiltration rate Air permeability value,	resent, use the value corresponding to th rgs); if equal user 0.35 floor, enter 0.2 (unscaled) or 0.1 iter 0.05, else enter 0 s and doors draught stripped q50, expressed in cubic metres	(sealed), else en 0.25 - [0.2 x ((8) + (10) + (' per hour per squ	after ter 0 (14) + 100] = (11) + (12) + (13) are metre of	i) + (15) =	0 0 0 0 0 0 3	
Structural infiltration: 0 if both types of walf are p deducting areas of openin If suspended wooden in If no draught lobby, en Percentage of window Window infiltration Infiltration rate Air permeability value, If based on air permeabili	resent, use the value corresponding to th ngs); if equal user 0.35 filoor, enter 0.2 (unsealed) or 0.1 iter 0.05, else enter 0 s and doors draught stripped	0.25 - [0.2 x ((8) + (10) + (1) per hour per squ , otherwise (18) = (16)	ter 0 (14) + 100] = (11) + (12) + (13) are metre of	3) + (15) = f envelope area	0 0 0 0 0	
Structural infiltration: 0 If both types of wall are p deducting areas of openi If suspended wooden in If no draught lobby, en Percentage of window Window infiltration Infiltration rate Air permeability value, apie Mumber of sides shelter	resent, use the value corresponding to th ngs); if equal user 0.35 floor, enter 0.2 (unscaled) or 0.1 iter 0.05, else enter 0 s and doors draught stripped q50, expressed in cubic metres lity value, then (15) = [(17) + 20]+(8).	0.25 - [0.2 x ((8) + (10) + (1) per hour per squ otherwise (18) = (16) or a degree air perme	after (ter 0 (14) + 100] = (11) + (12) + (13) are metre of (14) (12) + (15) (12) + (15) (14) + (15) + (15) (14) + (10) = (14) + (10) + (15)	3) + (15) = f envelope area	0 0 0 0 0 0 3	
Structural infiltration: 0 if both types of wall are p deducting areas of openil If suspended wooden i If no draught lobby, en Percentage of window Window infiltration Infiltration rate Air permeability value, If based on air permeabili	resent, use the value corresponding to th ngs); if equal user 0.35 floor, enter 0.2 (unscaled) or 0.1 iter 0.05, else enter 0 s and doors draught stripped q50, expressed in cubic metres lity value, then (15) = [(17) + 20]+(8).	0.25 - [0.2 x ((8) + (10) + (1) per hour per squ , otherwise (18) = (16)	after (ter 0 (14) + 100] = (11) + (12) + (13) (12) + (12) (12) + (13) (12) + (14) (12) + (15) (13) + (14) (14) + (10) = (14) + (12) + (13) (14) + (12) + (13) + (1	3) + (15) = f envelope area	0 0 0 0 0 0 3 0.15	

DER WorkSheet: New dwelling design stage

Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)me 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m + 4 (22a)m= 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18 Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.16 0.16 0.16 0.14 0.12 0.12 0.12 0.13 0.14 0.15 Calculate effective air change rate for the applicable case if mechanical ventilation: if mechanical ventilation: if schaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) [] 0.5 If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m= (22b)m + (23b) × [1 - (23c) + 100] [73] (24a)m= 0.3 0.29 0.27 0.27 0.26 0.26 0.27 0.28 0.28 (24a) b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0.26 0.27 0.28 0.28 3. Heat loss ELEMENT Gross Openings Net Area U-value A X U k-value A X k area (m²) m² A ,m² W/m2K (W/K) kJ/m²-K kJ/K Doors 2.4 2.4 Doors 24 x 1 = 24 (28) Windows Type 1 419 x1(11(1.3)+0.04) = 5178 (27) Windows Type 2 46.7 x1(11(1.3)+0.04) = 5178 (27) Windows Type 3 32 x1(11(1.3)+0.04) = 5.85 (27) Windows Type 4 5.2 x1(11(1.3)+0.04) = 6.43 (27) Rooflights 11.3 x1(11(1.3)+0.04) = 6.43 (27) Floor 178.5 x 0.1 = (176.5 (28) Walls Type 1 418.7 101.4 317.3 x 0.15 = (176.5 (28) Walls Type 2 79 0 79 x 0.14 = 11.02 (29) Walls Type 3 66.3 x 0.15 = 9.95 (29) Roof Type 1 170.4 11.3 159.1 x 0.13 = (30) Roof Type 2 40.5 0 40.5 x 0.13 = 5.26 (30) Total area of elements, m³< Windows Type 1

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* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph

** includ	le the area	is on both	sides of in	iternal wal	ls and part	titions									
Fabric	heat los	is, W/K =	= S (A x	U)				(26)(30)	+ (32) =				250.	86	(33)
Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (3	2) + (32a).	.(32e) =	0		(34)
Therm	al mass	parame	ter (TMF	P = Cm ⊣	TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250)	(35)
For desi	gn assess	ments wh	ere the de	tails of the	construct	ion are not	known pr	ecisely the	indicative	values of	TMP in Ta	ble 1f			-
		ad of a det													_
	•	es : S (L	'				<						47.	6	(36)
		al bridging	are not kn	own (36) =	0.05 x (3	1)									-
	abric he								(33) +				298.	46	(37)
Ventila		at loss ca		· · · ·							25)m x (5)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	170.17	168.35	166.52	157.39	155.57	146.44	146.44	144.61	150.09	155.57	159.22	162.87			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m				
(39)m=	468.64	466.81	464.98	455.85	454.03	444.9	444.9	443.07	448.55	454.03	457.68	461.33			
											Sum(39)	u /12=	455	.4	(39)
	<u> </u>	meter (H								= (39)m +	<u> </u>				
(40)m=	0.77	0.77	0.77	0.75	0.75	0.73	0.73	0.73	0.74	0.75	0.75	0.76			7
Numbe	ar of day	/s in mor	th (Tab	la 1a)				_		Average =	Sum(40),	.º /12=	0.7	5	(40)
Numbe		Feb	Mar	· · ·	Mari	-	Jul	A	Can	Oct	Neur	Dee			
(41)m=	Jan 31	28	31	Apr 30	May 31	Jun 30	31	Aug 31	Sep 30	31	Nov 30	Dec 31			(41)
(41)(1)-	31	20	31	30	31	30	31	31	30	31	30	31			(41)
					_										
A 10/-		ing oner		ino month											
	noi noai	ing ener	gynequ	irement.			_					KVVII/ye	al.	_	
				ilement.									-ai.		(42)
Assum	ied occu	ipancy, I	N		(-0.0003	149 x (TF	A -13.9)2)] + 0.(0013 x (FA -13		53	al.		(42)
Assum if TF if TF	ied occu A > 13.9 A £ 13.9	ipancy, f 9, N = 1 9, N = 1	v + 1.76 x	:[1 - exp						FA -13	9)	53	-ar.		
Assum if TF if TF Annua	ed occu A > 13.9 A £ 13.9 I averag	pancy, f 9, N = 1 9, N = 1 e hot wa	v + 1.76 x ater usag	: [1 - exp ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		9)		-ai.		(42) (43)
Assum if TF if TF Annua Reduce	A > 13.9 A 2 13.9 A £ 13.9 I averag	pancy, f 9, N = 1 9, N = 1 e hot wa	+ 1.76 x ter usag	:[1 - exp ge in litre usage by :	s per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)			9)	53			
Assum if TF if TF Annua Reduce	A > 13.9 A £ 13.9 A £ 13.9 I averag the annua that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p	+ 1.76 x tter usag hot water berson per	[1 - exp ge in litre usage by : day (all w	s per da 5% if the a ater use, I	ay Vd,av welling is not and co	erage = designed t d)	(25 x N) o achieve	+ 36 a water us	e target o	9) 118	53			
Assum if TF if TF Annua Reduce not more	A > 13.9 A > 13.9 A £ 13.9 I averag the annua that 125 Jan	ipancy, 1 9, N = 1 9, N = 1 e hot wa al average	+ 1.76 x ater usag hot water person per Mar	:[1 - exp ge in litre <i>usage by</i> : <i>day (all w</i> Apr	es per da 5% if the d ater use, I May	ay Vd,av welling is not and co Jun	erage = designed t d) Jul	(25 x N) o achieve Aug	+ 36		9)	53	201.		
Assum if TF if TF Annua Reduce not more	A > 13.9 A > 13.9 A £ 13.9 I averag the annua that 125 Jan	ipancy, f 9, N = 1 9, N = 1 e hot wa laverage litres per p Feb	+ 1.76 x ater usag hot water person per Mar	ter (1 - exp ge in litre usage by ter day (all w Apr ach month	es per da 5% if the d ater use, I May	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed t d) Jul	(25 x N) o achieve Aug	+ 36 a water us Sep	e target o	9) 118 Nov	53			
Assum if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I averag the annua that 125 Jan ar usage in	pancy, P 9, N = 1 9, N = 1 le hot wa al average litres per p Feb n litres per	+ 1.76 x ater usag hot water person per Mar day for ea	:[1 - exp ge in litre usage by : day (all w Apr	es per da 5% if the o ater use, l May Vd,m = fa	ay Vd,av welling is not and co Jun	erage = designed t d) Jul Fable 1c x	(25 x N) o achieve Aug (43)	+ 36 a water us Sep 115.68	e target o Oct 120.4	9) 118 7 Nov 125.12	53 3.04 Dec 129.84	1416	.45	
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	A > 13.9 A £ 13.9 A £ 13.9 I averag the annue a that 125 Jan ar usage in 129.84	Ipancy, I 9, N = 1 9, N = 1 le hot wa al average litres per p Feb n litres per 125.12	+ 1.76 x tter usag hot water person per Mar day for es 120.4	(1 - exp ge in litre usage by : day (all w Apr ach month 115.68	s per da 5% if the a sater use, I May Vd,m = fa 110.96	ay Vd,avi welling is not and col Jun ctor from 1 106.23	erage = designed t d) Jul Table 1c x 106.23	(25 x N) o achieve Aug (43) 110.96	+ 36 a water us Sep 115.68	e target o Oct 120.4 Fotal = Su	9) 118 Nov	53 3.04 Dec 129.84		.45	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	A > 13.9 A £ 13.9 A £ 13.9 I averag the annue a that 125 Jan ar usage in 129.84	Ipancy, I 9, N = 1 9, N = 1 le hot wa al average litres per p Feb n litres per 125.12	+ 1.76 x tter usag hot water person per Mar day for es 120.4	(1 - exp ge in litre usage by : day (all w Apr ach month 115.68	s per da 5% if the a sater use, I May Vd,m = fa 110.96	ay Vd,avi Iwelling is not and col Jun ctor from 1 106.23	erage = designed t d) Jul Table 1c x 106.23	(25 x N) o achieve Aug (43) 110.96	+ 36 a water us Sep 115.68	e target o Oct 120.4 Fotal = Su	9) 118 118 125.12 m(44) ₁₋₁₂ =	53 3.04 Dec 129.84		.45	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (A > 13.9 A £ 13.9 A £ 13.9 I averag the annue that 125 Jan ar usage in 129.84 content of	Pancy, N = 1 9, N = 1 9, N = 1 e hot was al average litres per p Feb n litres per 125.12 hot water	+ 1.76 x ater usag hot water berson per Mar day for ea 120.4 used - call	[1 - exp ge in litre usage by : day (all w Apr sch month 115.68 culated mo	es per da 5% if the d ater use, I May Vd,m = fa 110.96 onthly = 4.	ay Vd,avi Iwelling is Jun ctor from 1 106.23 190 x Vd,n	erage = designed t d) Jul Table 1c x 106.23 n x nm x D	(25 x N) o achieve (43) 110.96	+ 36 a water us Sep 115.68 0 kWh/mor 134.98	Oct 120.4 Total = Su th (see Ta 157.31	9) 118 Nov 125.12 m(44) ₁₋₁₂ = ables 1b, 1-	53 3.04 Dec 129.84 c, 1d) 186.47			(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy ((45)m=	A > 13.5 A £ 13.5 I averag the annue a that 125 Jan ar usage in 129.84	Pancy, N = 1 9, N = 1 9, N = 1 e hot was al average litres per p Feb n litres per 125.12 hot water	+ 1.76 x tter usag hot water person per Mar day for ea 120.4 used - call	[1 - exp ge in litre usage by : day (all w Apr ach month 115.68 culated mo 151.51	es per da 5% if the a ater use, I May Vd,m = fa 110.96 onthly = 4. 145.37	ay Vd, avi welling is in tot and coi ctor from 1 106.23 190 x Vd,n 125.45	erage = designed t d) Jul Table 1c x 106.23 n x nm x D 116.24	(25 x N) o achieve (43) 110.96 07m / 3600 133.39	+ 36 a water us Sep 115.68) kWh/mor 134.98	Oct 120.4 Total = Su th (see Ta 157.31	9) 118 125.12 m(44),	53 3.04 Dec 129.84 c, 1d) 186.47	1416		(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy ((45)m= If instant (46)m=	ed occu (A > 13.9 A £ 13.9 I average the annue a that 125 Jan 129.84 content of 192.55 taneous w 28.88	pancy, P P, N = 1 P, N = 1 e hot was litres per litres per 125.12 hot water 168.41 ater heatir 25.26	+ 1.76 x tter usag hot water person per Mar day for ea 120.4 used - call	[1 - exp ge in litre usage by : day (all w Apr ach month 115.68 culated mo 151.51	es per da 5% if the a ater use, I May Vd,m = fa 110.96 onthly = 4. 145.37	ay Vd, avi welling is in tot and coi ctor from 1 106.23 190 x Vd,n 125.45	erage = designed t d) Jul Table 1c x 106.23 n x nm x D 116.24	(25 x N) o achieve (43) 110.96 07m / 3600 133.39	+ 36 a water us Sep 115.68) kWh/mor 134.98	Oct 120.4 Total = Su th (see Ta 157.31	9) 118 125.12 m(44),	53 3.04 Dec 129.84 c, 1d) 186.47	1416		(43)
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Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy ((45)m= If instant (46)m= Water	ed occl A > 13.5 A £ 13.5 I averag the annucle that 125 Jan ar usage in 129.84 content of 192.55 taneous w 28.88 storage	ipancy, J a, N = 1 b, N = 1 b, N = 1 b, N = 1 it e hot water 125.12 hot water 168.41 vater heatin 25.26 loss:	+ 1.76 x atter usag hot water person per Mar day for ea 120.4 120.4 120.4 173.78 ag at point 26.07	e [1 - exp ge in litre usage by 3 day (all w Apr ach month 115.68 culated mo 151.51 of use (no 22.73	es per da 5% if the a later use, I May Vd,m = fa 110.96 onthly = 4. 145.37 o hot water 21.81	y Vd, ave welling is to out and cou during the ctor from 1 106.23 190 x Vd, n 125.45 storage), 18.82	erage = designed t (d) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44	(25 x N) o achieve (43) 110.96 07m / 3600 133.39 boxes (46) 20.01	+ 36 a water us Sep 115.68 kWh/mor 134.98 to (61)	Oct 120.4 Total = Su 157.31 Total = Su 23.6	9) 118 Nov 125.12 m(44),	53 3.04 Dec 129.84 c, 1d) 186.47	1416		(43)](44)](45)
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Assum if TE if TF Annua Reduce (44)m= Energy ((45)m= If instan (46)m= Water Storag If comi Otherv Water a) If m	A provided occur A > 13.3 A £ 13.4 I average the annuaut that 125 I 29.84 I 29.85 I 29.84 I 29.85 I 29.84 I 29.85 I 29.84 I 29.85 I 29	A service of the serv	+ 1.76 x ter usaççerson per day for ee 120.4 used - calidar ag at point 26.07 includim nd no ta hot wate	[1 - exp ge in litre usage by day (all w Apr ach month 115.68 culated mo 151.51 of use (no 22.73 ng any so ank in dw er (this in oss facto	ss per da 5% if the o ater use, h May Vd,m = fa 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e ucludes i	ay Vd, avv welling is hot and cou ctor from 1 106.23 190 x Vd,n 125.45 storage), 18.82 /WHRS nter 110 nstantar	erage = designed t d) Jul 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in neous co	(25 x N) o achieve (43) 110.96 07m / 3600 133.39 boxes (46) 20.01 within sa (47)	+ 36 a water us Sep 115.68 0 kWh/mon 134.98 0 to (61) 20.25 ame vess	Total = Su Total = Su Total = Su Total = Su Total = Su 23.6 Sel	9) 118 Nov 125.12 m(44)	53 53 Dec (129.84 c, (1) 186.47 27.97 250	1416		(43)](44)](45) (46) (47) (48)
Assum if TE if TF Annua Reduce (44)m= Energy ((45)m= If instan (46)m= Water Storag If comi Otherv Water a) If m	A provided occur A > 13.3 A £ 13.4 I average the annuaut that 125 I 29.84 I 29.85 I 29.84 I 29.85 I 29.84 I 29.85 I 29.84 I 29.85 I 29	pancy, J D, N = 1 e hot was laverage litres per p feb n litres per p 125.12 hot water 188.41 vater heatin 25.26 loss: e (litres) e stored loss:	+ 1.76 x ter usaççerson per day for ee 120.4 used - calidar ag at point 26.07 includim nd no ta hot wate	[1 - exp ge in litre usage by day (all w Apr ach month 115.68 culated mo 151.51 of use (no 22.73 ng any so ank in dw er (this in oss facto	ss per da 5% if the o ater use, h May Vd,m = fa 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e ucludes i	ay Vd, avv welling is hot and cou ctor from 1 106.23 190 x Vd,n 125.45 storage), 18.82 /WHRS nter 110 nstantar	erage = designed t d) Jul 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in neous co	(25 x N) o achieve (43) 110.96 07m / 3600 133.39 boxes (46) 20.01 within sa (47)	+ 36 a water us Sep 115.68 0 kWh/mon 134.98 0 to (61) 20.25 ame vess	Total = Su Total = Su Total = Su Total = Su Total = Su 23.6 Sel	9) 118 Nov 125.12 m(44)	53 3.04 129.84 c, 1d) 186.47 27.97 250	1416		(43)](44)](45) (46) (47)



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nera														
			storage					(48) x (49) =		1.	.05		(
			eclared of factor fr									0		(
			ee secti		10 2 (1111	11/110/06	xy)					U		6
		from Ta										0		(
empe	erature f	actor fro	m Table	2b								0		(
nerg	y lost fro	m water	storage	, kWh/y	ear			(47) x (51) x (52) x (53) =		0		(
Enter	(50) or	(54) in (S	55)								1.	.05		(
Vater	storage	loss cal	culated f	or each	month			((56)m =	55) × (41)	m				
56)m=	32.64	29.48	32.64	31.59	32.64	31.59	32.64	32.64	31.59	32.64	31.59	32.64		(
cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) - ((H11)] + (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
57)m=	32.64	29.48	32.64	31.59	32.64	31.59	32.64	32.64	31.59	32.64	31.59	32.64		(
rimar	ry circuit	loss (ar	nual) fro	m Table	- 3						·	0		(
	·	· ·	culated 1			59)m =	(58) ÷ 36	65 × (41)m					
(mo	, dified by	/ factor f	rom Tab	le H5 if t	there is s	solar wa	ter heati	ng and a	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		(
ombi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 3	65 × (41)m						
51)m=	0	0	0	0	0	0	0	0	0	0	0	0		(
otal h	neat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	45)m +	(46)m +	(57)m +	(59)m +	(61)m
2)m=			229.69		201.28	179.55	172.15	189.3	189.09	213.22	225.82	242.38	(00)	(01)
olar Di	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantit	(enter '(if no sola	r contribut	on to wate	r heating)		
						(III) (III) gui	TO quanti	, cinci c	1110 0010	i oonunbui				
		I lines it	FGHRS	and/or V	WWHRS	applies	see An	pendix (G)					
	0	I lines if	FGHRS 0	and/or \ 0	WWHRS	applies	, see Ap	pendix 0	G)	0	0	0		((
53)m=	0	0	0							0	0	0		(
i3)m=)utpu'	0 t from w		0							0	0	0		(
i3)m=)utpu'	0 t from w	0 ater hea	0 ter	0	0	0	0	0	0	213.22	225.82	242.38	2515	,
i3)m=)utpu' i4)m=	0 t from w 248.46	0 ater hea 218.9	0 ter 229.69	0 205.61	0 201.28	0	0	0 189.3 Out	0 189.09 put from w	213.22 ater heate	225.82 r (annual),	242.38		,
3)m=)utpu i4)m= leat g	0 t from w 248.46	0 ater hea 218.9	0 ter	0 205.61	0 201.28	0	0	0 189.3 Out	0 189.09 put from w	213.22 ater heate	225.82 r (annual),	242.38		,
i3)m=)utpu' i4)m= leat g i5)m=	0 t from w 248.46 gains fro 108.75	0 ater hea 218.9 m water 96.39	0 ter 229.69 heating, 102.51	0 205.61 kWh/m 93.66	0 201.28 onth 0.22 93.06	0 179.55 5 ' [0.85 84.99	0 172,15 × (45)m 83.38	0 189.3 Out + (61)n 89.08	0 189.09 put from w n] + 0.8 x 88.16	213.22 ater heate ((46)m 97.03	225.82 r (annual), + (57)m 100.38	242.38 + (59)m 106.73]	.43 ((
33)m= Outpu 64)m= leat g 55)m= inclu	0 t from w 248.46 gains fro 108.75 ude (57)	0 ater hea 218.9 m water 96.39 m in cale	0 ter 229.69 heating, 102.51 culation o	0 205.61 kWh/m 93.66 of (65)m	0 201.28 0nth 0.29 93.06	0 179.55 5 ' [0.85 84.99	0 172,15 × (45)m 83.38	0 189.3 Out + (61)n 89.08	0 189.09 put from w n] + 0.8 x 88.16	213.22 ater heate ((46)m 97.03	225.82 r (annual), + (57)m 100.38	242.38 + (59)m 106.73]	.43 ((
33)m= Dutpu 54)m= leat g 55)m= inclu 5. In	0 t from w 248.46 ains fro 108.75 ude (57) ternal ga	0 ater hea 218.9 m water 96.39 m in cale ains (see	0 ter 229.69 heating, 102.51 culation of Table 5	0 205.61 kWh/m 93.66 of (65)m and 5a	0 201.28 0nth 0.29 93.06	0 179.55 5 ' [0.85 84.99	0 172,15 × (45)m 83.38	0 189.3 Out + (61)n 89.08	0 189.09 put from w n] + 0.8 x 88.16	213.22 ater heate ((46)m 97.03	225.82 r (annual), + (57)m 100.38	242.38 + (59)m 106.73]	.43 ((
i3)m=)utpu i4)m= i6)m= i5)m= inclu 5. In	0 t from w 248.46 108.75 ude (57) ternal ga olic gain	0 ater hea 218.9 m water 96.39 m in calo ains (see ains (see	0 ter 229.69 heating, 102.51 culation o Table 5 5), Wat	0 205.61 kWh/m 93.66 of (65)m i and 5a ts	0 201.28 93.06 0 only if c):	0 179.55 5 ' [0.85 84.99 :ylinder i	0 172,15 × (45)m 83.38 s in the o	0 189.3 Out 1 + (61)n 89.08 dwelling	0 189.09 put from w n] + 0.8 x 88.16 or hot w	213.22 ater heate ([(46)m 97.03 ater is fr	225.82 r (annual), + (57)m 100.38 rom com	242.38 + (59)m 106.73 munity h]	.43 ((
3)m= utpu 4)m= eat g 5)m= inclu 5. In letab	0 t from w 248.46 108.75 ude (57) ternal ga olic gain Jan	0 ater hea 218.9 m water 96.39 m in cale ains (see s (Table Feb	0 ter 229.69 heating, 102.51 culation o Table 5 5), Wat Mar	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr	0 201.28 93.06 0 only if c): May	0 179.55 5 ' [0.85 84.99 :ylinder i Jun	0 172,15 × (45)m 83.38 s in the 0 Jul	0 189.3 Out 1+ (61)n 89.08 dwelling Aug	0 189.09 put from w n] + 0.8 x 88.16 or hot w Sep	213.22 ater heate ((46)m 97.03 ater is fr	225.82 r (annual); + (57)m 100.38 rom com	242.38 + (59)m 106.73 munity h]	.43 ((
i3)m= Outpu i4)m= i6)m= inclu 5. In letab	0 t from w 248.46 108.75 ude (57) ternal ga olic gain Jan 176.5	0 ater hea 218.9 m water 96.39 m in calo ains (see ss (Table Feb 176.5	0 ter 229.69 heating, 102.51 culation o 5), Wat Mar 176.5	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5	0 201.28 93.06 0 only if c): May 176.5	0 179.55 5 ' [0.85 84.99 :ylinder i Jun 176.5	0 172,15 × (45)m 83.38 s in the o Jul 176.5	0 189.3 Out 1 + (61)n 89.08 dwelling Aug 176.5	0 189.09 put from w n] + 0.8 s 88.16 or hot w Sep 176.5	213.22 ater heate ([(46)m 97.03 ater is fr	225.82 r (annual), + (57)m 100.38 rom com	242.38 + (59)m 106.73 munity h]	.43 ((
3)m= 9utpu 44)m= leat g 55)m= inclu 55. In 1etab	o t from w 248.46 248.46 108.75 Jude (57) ternal ga olic gair Jan 176.5 og gains	0 218.9 m water 96.39 m in cake ains (see s (Table Feb 176.5 (calcula	0 ter 229.69 heating, 102.51 culation o 5), Wat 5), Wat 176.5 ted in Ap	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix	0 201.28 93.06 0 only if c): May 176.5 L, equat	0 179.55 5 ' [0.85 84.99 :ylinder i 176.5 ion L9 o	0 172.15 × (45)m 83.38 s in the o Jul 176.5 r L9a), a	0 189.3 Out + (61)rl 89.08 dwelling Aug 176.5 Iso see	0 189.09 put from w n] + 0.8 s 88.16 or hot w Sep 176.5 Table 5	213.22 ater heate ((46)m 97.03 ater is fr Oct 176.5	225.82 r (annual), + (57)m 100.38 om com Nov 176.5	242.38 + (59)m 106.73 munity h Dec 176.5]	.43 ((
3)m= Output (4)m= (55)m= (55)m= (55)m= (60)m= (60)m= (60)m= (60)m= (60)m= (77)m=	0 t from w 248.46 248.46 108.75 ude (57) ternal ge olic gain 176.5 ng gains 61.21	0 ater hea 218.9 m water 96.39 m in calo ans (See Feb 176.5 (calcula 54.37	0 ter 229.69 heating, 102.51 culation o Table 5 . Wat Mar 176.5 ted in Ap 44.21	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix 33.47	0 201.28 201.28 201.28 30.06 30.001y if c 30.01 201.2 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30	0 179.55 5 ' [0.85 84.99 :ylinder i 176.5 ion L9 o 21.12	0 172,15 × (45)m 83.38 s in the 0 Jul 176.5 r L9a), a 22.83	0 189.3 Out 1+ (61)r 89.08 dwelling Aug 176.5 Iso see 29.67	0 189.09 189.09 put from w n] + 0.8 2 88.16 or hot w Sep 176.5 Table 5 39.82	213.22 ater heate ((46)m 97.03 ater is fi Oct 176.5 50.56	225.82 r (annual); + (57)m 100.38 rom com	242.38 + (59)m 106.73 munity h]	.43 ((
3)m= Dutput (4)m= (5)m= inclu 5. In letab (6)m= ightin (7)m= pplia	0 t from w 248.46 ains fro 108.75 ude (57) ternal ga olic gain 176.5 ng gains 61.21 nces ga	0 ater hea 218.9 m water 96.39 m in calo ains (see Feb 176.5 (calcula 54.37 ins (calc	0 ter 229.69 heating, 102.51 culation of Table 5 Table 5 Wat 176.5 ted in Ap 44.21 ulated in	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix 33.47 Append	0 201.28 201.28 0 onth 0.22 93.06 0 only if c): 176.5 L, equat 25.02 dix L, eq	0 179.55 5 ' [0.85 84.99 cylinder i 176.5 ion L9 o 21.12 uation L	0 172,15 × (45)m 83.38 s in the 0 Jul 176.5 r L9a), a 22.83 13 or L1	0 189.3 Out + (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also	0 189.09 189.09 189.09 189.09 88.16 or hot w Sep 176.5 Table 5 39.82 p see Ta	213.22 ater heate ([(46)m 97.03 ater is fi 0ct 176.5 50.56 ble 5	225.82 r (annual), + (57)m 100.38 rom com Nov 176.5 59.01	242.38 + (59)m 106.73 munity F Dec 176.5 62.91]	. <u>.43</u> ((((
3)m= butput 44)m= leat g 55)m= inclu 5. In letab 60m= ightin 77)m= pplia 80m=	0 t from w 248.46 yains fro 108.75 ude (57) ternal ge olic gain Jan 176.5 og gains 61.21 nces ga 675.49	0 ater hea 218.9 m water 96.39 m in cala ains (see s (Table Feb 176.5 (calcula 54.37 ins (calc 682.5	0 ter 229.69 heating, 102.51 culation o Table 5 5), Wat Mar 176.5 ted in Ap 44.21 ulated in 664.84	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix 33.47 Append 627.24	0 201.28 0 onth 0.22 93.06 0 only if c): 176.5 L, equat 25.02 dix L, eq 579.77	0 179.55 5 ' [0.85 84.99 cylinder i 176.5 ion L9 o 21.12 uation L 535.15	0 172,15 × (45)m 83.38 s in the o Jul 176.5 r L9a), a 22.83 13 or L1 505.35	0 189.3 Out + (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also 498.34	0 189.09 189.09 189.09 189.09 88.16 or hot w Sep 176.5 Table 5 39.82 o see Ta 516	213.22 aler heate ((46)m 97.03 ater is fr 0ct 176.5 50.56 ble 5 553.61	225.82 r (annual), + (57)m 100.38 om com Nov 176.5	242.38 + (59)m 106.73 munity h Dec 176.5]	.43 ((
3)m= butputu 4)m= 14)m= 16	0 t from w 248.46 108.75 ude (57) ternal ge olic gain 176.5 og gains 61.21 nces ga 675.49 ng gains	0 ater hea 218.9 m water 96.39 m in cale ins (See 56.37 ins (calcula 54.37 ins (calcula 682.5 i (calcula)	0 ter 229.69 heating, 102.51 culation of Table 5 5), Wat Mar 176.5 ted in Ap 44.21 ulated in 664.84 tted in A	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 spendix 33.47 Appendix 627.24 opendix	0 201.28 0 onth 0.22 93.06 0 only if c): 176.5 L, equat 25.02 dix L, equat 579.77 L, equat	0 179.55 5 ' [0.85 84.99 sylinder i 176.5 ion L9 o 21.12 uation L 535.15 tion L15	0 172,15 × (45)m 83.38 s in the 176.5 r L9a), a 22.83 13 or L1 505.35 or L15a	0 189.3 Out 1+ (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also 498.34), also s	0 189.09 put from w n] + 0.8 3 88.16 or hot w Sep 176.5 Table 5 39.82 5 see Ta 516 ee Table	213.22 ater heate ((46)m 97.03 ater is fr 97.03 ater is fr 176.5 50.56 ble 5 553.61 5	225.82 r (annual), + (57)m 100.38 rom com Nov 176.5 59.01 601.08	242.38 (59)m 106.73 munity F Dec 176.5 62.91 645.69]	. <u>.43</u> ((((((
(3)m= (4)m= (4)m= (4)m= (5)m= (5)m= (6)m	0 t from w 248.46 248.46 108.75 ude (57) ternal ga olic gain 176.5 ug gains 61.21 nces ga 675.49 ng gains 40.65	0 ater hea 218.9 m water 96.39 m in cale ins (see s (Table Feb 176.5 (calcula 54.37 ins (calc 682.5 c (calcula 40.65	0 ter 229.69 heating, 102.51 culation of Table 5 5), Wat 176.5 ted in Ap 44.21 culated in 664.84 tted in Ap	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix 33.47 Appendix 627.24 opendix 40.65	0 201.28 0 onth 0.22 93.06 0 only if c): 176.5 L, equat 25.02 dix L, eq 579.77	0 179.55 5 ' [0.85 84.99 cylinder i 176.5 ion L9 o 21.12 uation L 535.15	0 172,15 × (45)m 83.38 s in the o Jul 176.5 r L9a), a 22.83 13 or L1 505.35	0 189.3 Out + (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also 498.34	0 189.09 189.09 189.09 189.09 88.16 or hot w Sep 176.5 Table 5 39.82 o see Ta 516	213.22 ater heate ((46)m 97.03 ater is fr 0ct 176.5 50.56 ble 5 553.61	225.82 r (annual), + (57)m 100.38 rom com Nov 176.5 59.01	242.38 + (59)m 106.73 munity F Dec 176.5 62.91]	. <u>.43</u> ((((
33)m= Output 44)m= 44)m= 450m= inclu 550m= 46tab 66)m= ightin 570m= pplia 880m= Cookir 590m= 2000kir 590m=	0 t from w 248.46 108.75 ude (57) ternal ge olic gain 176.5 ng gains 61.21 nces ga 675.49 ng gains 40.65 s and fat	0 ater hea 218.9 m water 96.39 m in cala ans (see s (Table Feb 176.5 (calcula 54.37 ins (calc 682.5 a (calcula 40.65 ns gains	0 ter 229.69 heating, 102.51 culation of Table 5 5), Wat 176.5 ted in Ap 44.21 sulated in 664.84 tted in Ap 664.84 tted in Ap	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix 33.47 Appendix 627.24 opendix 40.65 5a)	0 201.28 93.06 93.06 0 only if c): May 176.5 L, equat 25.02 dix L, eq 579.77 L, equal 40.65	0 179.55 5 ' [0.85 84.99 ylinder i Jun 176.5 ion L9 o 21.12 uation L 535.15 tion L15 40.65	0 172,15 × (45)m 83.38 s in the of Jul 176.5 r L9a), a 22.83 13 or L1 505.35 or L15a 40.65	0 189.3 Out + (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also 498.34), also s 40.65	0 189.09 put from w al + 0.8 2 88.16 or hot w Sep 176.5 Table 5 39.82 o see Ta 516 ee Table 40.65	213.22 aler heate ([(46)m 97.03 ater is fr 176.5 50.56 ble 5 553.61 5 40.65	225.82 r (annual), + (57)m 100.38 rom com 176.5 59.01 601.08 40.65	242.38 + (59)m 106.73 munity h Dec 176.5 62.91 645.69 40.65]	.43 ((((() () () ()
33)m= Output 44)m= 44)m= 450m= inclu 550m= 46tab 66)m= ightin 570m= pplia 880m= Cookir 590m= 2000kir 590m=	0 t from w 248.46 248.46 108.75 ude (57) ternal ga olic gain 176.5 ug gains 61.21 nces ga 675.49 ng gains 40.65	0 ater hea 218.9 m water 96.39 m in cale ins (see s (Table Feb 176.5 (calcula 54.37 ins (calc 682.5 c (calcula 40.65	0 ter 229.69 heating, 102.51 culation of Table 5 5), Wat 176.5 ted in Ap 44.21 culated in 664.84 tted in Ap	0 205.61 kWh/m 93.66 of (65)m and 5a ts Apr 176.5 opendix 33.47 Appendix 627.24 opendix 40.65	0 201.28 0 onth 0.22 93.06 0 only if c): 176.5 L, equat 25.02 dix L, equat 579.77 L, equat	0 179.55 5 ' [0.85 84.99 sylinder i 176.5 ion L9 o 21.12 uation L 535.15 tion L15	0 172,15 × (45)m 83.38 s in the 176.5 r L9a), a 22.83 13 or L1 505.35 or L15a	0 189.3 Out 1+ (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also 498.34), also s	0 189.09 put from w n] + 0.8 3 88.16 or hot w Sep 176.5 Table 5 39.82 5 see Ta 516 ee Table	213.22 ater heate ((46)m 97.03 ater is fr 97.03 ater is fr 176.5 50.56 ble 5 553.61 5	225.82 r (annual), + (57)m 100.38 rom com Nov 176.5 59.01 601.08	242.38 (59)m 106.73 munity F Dec 176.5 62.91 645.69]	. <u>.43</u> ((((((
33)m= Dutpui Dutpui 54)m= inclu 55)m= inclu 55, In Metab 36)m= ightin 37)m= ightin 37)m= cookir 39)m= Pumps 70)m=	0 t from w 248.46 108.75 108.75 108.75 108.75 109.75 176.5 109.29 176.5 109.29 109.29 109.25 109	0 ater head ater hea	0 ter 229.69 heating, 102.51 culation of Table 5 5), Wat 176.5 ted in Ap 44.21 sulated in 664.84 tted in Ap 664.84 tted in Ap	0 205.61 8 4 8 4 93.66 5 0 5 6 5 9 93.66 5 6 5 9 93.66 5 9 93.66 5 9 93.66 5 9 93.66 5 9 93.66 5 9 93.66 5 9 7 9 7 9 7 9 7 9 7 9 9 7 9 9 9 9 9 9	0 201.28 93.06 93.06 0 only if c): 176.5 L, equat 25.02 dix L, eq 579.77 L, equat 40.65 0	0 179.55 5 ' [0.85 84.99 yylinder i 176.5 ion L9 o 21.12 uation L 535.15 ion L15 40.65 0	0 172,15 × (45)m 83.38 s in the of Jul 176.5 r L9a), a 22.83 13 or L1 505.35 or L15a 40.65	0 189.3 Out + (61)n 89.08 dwelling 176.5 Iso see 29.67 3a), also 498.34), also s 40.65	0 189.09 put from w al + 0.8 2 88.16 or hot w Sep 176.5 Table 5 39.82 o see Ta 516 ee Table 40.65	213.22 aler heate ([(46)m 97.03 ater is fr 176.5 50.56 ble 5 553.61 5 40.65	225.82 r (annual), + (57)m 100.38 rom com 176.5 59.01 601.08 40.65	242.38 + (59)m 106.73 munity h Dec 176.5 62.91 645.69 40.65]	.43 ((((() () () ()

DER WorkSheet: New dwelling design stage

(72)m=	146.17	143.44	137.78	130.0	125.0	B '	118.04	112.06	119	.73 122.45	130.4	2 139.41	143.45		(72)
Total i	nterna	l qains =					(66))m + (67)m	+ (68	s)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m=	958.82	956.26	922.78	866.74	805.8	2 7	750.27	716.19	723	.69 754.23	810.5	4 875.45	928	1	(73)
6. Sol	ar gain	IS:								_				_	
Solar g	ains are	calculated (using sola	ar flux fro	m Table 6	a an	d assoc	iated equa	tions	to convert to th	e applic	able orientati	on.		
Orienta		Access F	actor	Are			Flu			g_		FF		Gains	
		Table 6d		m	2		Tal	ble 6a		Table 6b		Table 6c		(W)	
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×	1	1.28	x	0.63	×	0.7	=	11.03	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×	2	22.97	x	0.63	×	0.7	=	22.46	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×	4	11.38	x	0.63	×	0.7	=	40.47	(75)
Northea	ist <mark>0.9x</mark>	0.77	×		3.2	×	e	67.96	x	0.63	×	0.7	=	66.46	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×	9	91.35	×	0.63	×	0.7	-	89.33	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×	9	97.38	×	0.63	×	0.7	-	95.24	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×		91.1	x	0.63	×	0.7	-	89.09	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×	7	2.63	x	0.63	×	0.7	-	71.03	(75)
Northea	ist 0.9x	0.77	— ×		3.2	×	5	50.42	×	0.63	×	0.7	-	49.31	(75)
Northea	ist 0.9x	0.77	x		3.2	×	2	28.07	x	0.63	×	0.7	-	27.45	(75)
Northea	ist <mark>0.9x</mark>	0.77	×		3.2	×		14.2	×	0.63	×	0.7	-	13.88	(75)
Northea	ıst <mark>0.9x</mark>	0.77	×		3.2	×		9.21	x	0.63	×	0.7	-	9.01	(75)
Southea	ast <mark>0.9x</mark>	0.77	×		8.7	×	3	86.79	×	0.63	×	0.7	-	547.62	(77)
Southea	ast <mark>0.9x</mark>	0.77	7 ×		8.7	×	e	62.67	x	0.63	×	0.7	-	932.79	(77)
Southea	ast 0.9x	0.77	- •		8.7	×		5.75	x	0.63	×	0.7	-	1276.29	(77)
Southea	ast <mark>0.9x</mark>	0.77	- ×	-	8.7	×	1	06.25	x	0.63	٦×	0.7	-	1581.38	(77)
Southea	ast <mark>0.9x</mark>	0.77	-		8.7	x	1	19.01	x	0.63	×	0.7	- ٦	1771.28	(77)
Southea	ast <mark>0.9x</mark>	0.77	_ ×		8.7	×	1	18.15	x	0.63	×	0.7	=	1758.47	(77)
Southea	ast <mark>0.9x</mark>	0.77	x		8.7	×	1	13.91	x	0.63	×	0.7	- 1	1695.35	(77)
Southea	ast <mark>0.9x</mark>	0.77	x		8.7	×	1	04.39	x	0.63	×	0.7		1553.68	(77)
Southea	ast <mark>0.9x</mark>	0.77	_ ×		8.7	×	9	92.85	x	0.63	×	0.7	-	1381.95	(77)
Southea	ast <mark>o.9x</mark>	0.77	╡,	-	8.7	x	e	69.27	x	0.63	۲× آ	0.7	- ۲	1030.93	(77)
Southea	ast <mark>o.9x</mark>	0.77	╡,	-	8.7	x	4	14.07	x	0.63	۲,	0.7	- ۲	655.92	(77)
Southea	ast <mark>0.9x</mark>	0.77	Ξ,	-	8.7	x	3	31.49	x	0.63	۲,	0.7	- ۲	468.64	(77)
Southw	est <mark>o.9x</mark>	0.77	-	-	1.9	×	3	86.79		0.63	× ٦	0.7	=	471.15	(79)
Southw	est <mark>o.9x</mark>	0.77	-		5.2	×	3	86.79		0.63	٦×	0.7	=	58.47	(79)
Southw	est <mark>o.9x</mark>	0.77	Ξ,	-	1.9	x	e	62.67		0.63	۲,	0.7	- ۲	802.55	(79)
Southw	est <mark>o.9x</mark>	0.77	-		5.2	×	6	62.67		0.63	٦×	0.7	=	99.6	(79)
Southw	est <mark>o.9x</mark>	0.77	-		1.9	×	8	35.75		0.63	× ٦	0.7	-	1098.08	(79)
Southw	est <mark>o.9x</mark>	0.77	- ,		5.2	x	8	35.75		0.63	۲,	0.7	- ۲	136.28	(79)
Southw	est <mark>o.9x</mark>	0.77	-		1.9	×	1	06.25		0.63	× ٦	0.7	-	1360.57	(79)
Southw	esto 9v	0.77	\dashv	Ē	5.2	i .		06.25		0.63	۲, ۲	0.7	۲.	168.85	(79)

DER WorkSheet: New dwelling design stage

																_
Southwesto.9	0.77	×	41.	9	x	11	19.01		0.63		x	0.7		=	1523.95	(79)
Southwest0.9	0.77	×	5.2	2	x	11	19.01]	0.63		×	0.7		=	189.13	(79)
Southwesto.9	0.77	×	41.	9	x	11	18.15]	0.63		x	0.7		=	1512.93	(79)
Southwesto.9	0.77	x	5.2	2	x	11	18.15]	0.63		×	0.7		=	187.76	(79)
Southwesto.9	0.77	x	41.	9	x	11	13.91]	0.63		x	0.7		=	1458.63	(79)
Southwesto.9	0.77	x	5.2	2	x	11	13.91]	0.63		x	0.7		=	181.02	(79)
Southwesto.9	0.77	x	41.	9	x	10	04.39]	0.63		x	0.7		=	1336.74	(79)
Southwesto.9	0.77	x	5.2	2	x	10	04.39]	0.63		x	0.7		=	165.9	(79)
Southwesto.9	0.77	x	41.	9	x	9	2.85]	0.63		x	0.7		=	1188.99	(79)
Southwesto.9	0.77	x	5.2	2	x	9	2.85]	0.63		x	0.7		=	147.56	(79)
Southwest 0.9	0.77	x	41.	9	x	6	9.27]	0.63		x	0.7		=	886.98	(79)
Southwest 0.9	0.77	x	5.2	2	x	6	9.27]	0.63		x	0.7		=	110.08	(79)
Southwest 0.9	0.77	x	41.	9	x	4	4.07]	0.63		x	0.7		=	564.33	(79)
Southwest 0.9	0.77	x	5.2	2	x	4	4.07]	0.63		x	0.7		=	70.04	(79)
Southwesto.9	0.77	x	41.	9	x	3	1.49]	0.63		x	0.7		=	403.21	(79)
Southwesto.9	0.77	x	5.2	2	x	3	1.49]	0.63		x	0.7		=	50.04	(79)
Rooflights 0.9	(1	x	11.	3	x		26	x	0.3		x	0.7		=	55.53	(82)
Rooflights 0.9	(1	x	11.	3	x		54	×	0.3		x	0.7		-	115.33	(82)
Rooflights 0.9	1	×	11.	3	x		96	×	0.3		x	0.7		-	205.03	(82)
Rooflights 0.9	(1	×	11.	3	x		150	x	0.3		x	0.7		=	320.36	(82)
Rooflights 0.9	(1	×	11.	3	x		192	×	0.3		x	0.7		=	410.05	(82)
Rooflights 0.9	(1	×	11.	3	×		200	×	0.3		x	0.7		=	427.14	(82)
Rooflights 0.9	1	×	11.	3	x		189	×	0.3		x	0.7		=	403.65	(82)
Rooflights 0.9	(1	×	11.	3	x		157	x	0.3		x	0.7		=	335.3	(82)
Rooflights 0.9	(1	x	11.	3	x		115	x	0.3		x	0.7		=	245.61	(82)
Rooflights 0.9	(1	x	11.	3	x		66	×	0.3		x	0.7		=	140.96	(82)
Rooflights 0.9	(1	x	11.	3	x		33	×	0.3		x	0.7		=	70.48	(82)
Rooflights 0.9	(1	x	11.	3	x		21	×	0.3		x	0.7		=	44.85	(82)
		-								_			_			
Solar gains i	· · · ·				-			_	i = Sum(74)r	_	_			_		
(83)m= 1143.			3497.62			981.54	3827.74	346	2.65 3013.4	11 2	196.4	1374.65	975.	75		(83)
Total gains -			<u> </u>	. ,												
(84)m= 2102.6	32 2928.98	3678.92	4364.36	4789.57	4	731.81	4543.93	418	3767.6	53 30	006.9	4 2250.1	1903	.75		(84)

	ation fac	•				•		ole 9, Th	. (-)				21 (8
Ouns	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	0.99	0.95	0.82	0.6	0.43	0.49	0.78	0.99	1	1	(8)
Mear	internal	temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
	21	21	21	21	21	21	21	21	21	21	21	21	(8)

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DER WorkSheet: New dwelling design stage

(89)m=	1	1	0.99	0.94	0.77	0.53	0.36	0.41	0.72	0.98	1	1]	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tab	le 9c)		1	1	
(90)m=	20.28	20.28	20.28	20.3	20.3	20.31	20.31	20.31	20.31	20.3	20.29	20.29	1	(90)
										fLA = Livin	g area + (4) =	0.24	(91)
Maam	Intomo	l temper	at una /fa		مام مادرما	(ling) - 6	A T4	. /1 .0	A) TO					
(92)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.48	20.47	20.47	20.46	1	(92)
		nent to t									20.47	20.40]	()
(93)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.48	20.47	20.47	20.46	1	(93)
		tina rea			20.41	20.40	20.40	20.40	20.40	20.41	20.47	20.40]	()
_		· ·			re obtein		an 11 af	Table O		4 Ti	76)	d 10 001		
		mean in factor fo				ied at st	ep 11 or	Table 9	b, so tha	it 11,m=(76)m an	id re-calo	culate	
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Utilisa		tor for g			may	oun	oui	, tug	000	000		500	1	
(94)m=	1	1	0.99	0.94	0.78	0.55	0.38	0.43	0.73	0.98	1	1	1	(94)
	ul gains	hmGm	W = (9	4)m x (8	4)m								1	
		2925.98	· · ·	/ (3752.87	2600.17	1724.94	1806.09	2755.79	2948.31	2248.96	1903.67	1	(95)
		age exte												
(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	1	(96)
		e for me	an interr	al temp	erature	m Wa	-[(39)m	x [(93)m	(96)m	1			1	
	7570.03	_	_		_		1725.85	1808.27	<u> </u>	<u> </u>	6117.01	7501.85	1	(97)
							-		2859.6	4480.91		7501.85	1	(87)
Space		g requir					-				1)m]	(87)
	e heatin	g requir	ement fo	r each r	nonth, k	Nh/mon	th = 0.02	4 x [(97 0)m – (95 0)m] x (4 1140.25	1)m 2784.99	4165.04	18187.26	
Spac (98)m=	e heatin 4067.9	g requin 2913.39	ement fo 2113.47	832.14	nonth, kl	Nh/mon	th = 0.02	4 x [(97 0)m – (95)m] x (4 1140.25	1)m 2784.99	4165.04	18187.26	(98)
Spac (98)m=	e heatin 4067.9	g requir	ement fo 2113.47	832.14	nonth, kl	Nh/mon	th = 0.02	4 x [(97 0)m – (95 0)m] x (4 1140.25	1)m 2784.99	4165.04	18187.26	
Space (98)m= Space	e heatin 4067.9 e heatin	g requin 2913.39	ement fo 2113.47 ement in	832.14 kWh/m	nonth, kl	Nh/mon	th = 0.02	4 x [(97 0)m – (95 0)m] x (4 1140.25	1)m 2784.99	4165.04		(98)
Space (98)m= Space 8c. S	e heatin 4067.9 e heatin pace co	g requin 2913.39 g requin oling req r June,	ement fo 2113.47 ement in uiremen	kWh/m August.	170,08 170,08 2/year See Tal	Wh/mon 0	th = 0.02	24 x [(97 0 Tota)m — (95 0 Il per year)m] x (4 1140.25 (kWh/yea	1)m 2784.99) = Sum(\$	4165.04 (8), 58.12		(98)
Space (98)m= Space 8c. S Calcu	e heatin 4067.9 e heatin pace co ilated fo Jan	g requin 2913.39 g requin oling req r June, c Feb	ement fo 2113.47 ement in uiremen July and Mar	kWh/m August.	2/year	Vh/mon 0 ole 10b Jun	th = 0.02 0 Jul	24 x [(97 0 Tota)m – (95 0 I per year Sep)m] x (4 1140.25 (kWh/year Oct	1)m 2784.99) = Sum(9 Nov	4165.04 (8) =	30	(98)
Space (98)m= Space 8c. Space Calcu Heat	e heatin 4067.9 e heatin pace co llated fo Jan loss rat	g requin 2913.39 g requin oling req r June, , Feb e Lm (ca	ement fo 2113.47 ement in uiremen July and Mar ilculated	kWh/m August. Apr using 2	2/year See Tal May 5°C inter	Wh/mon 0 Die 10b Jun nal temp	th = 0.02 0 Jul perature	Aug and exte)m – (95 0 I per year Sep ernal ter)m] x (4 1140.25 (kWh/year Oct	1)m 2784.99) = Sum(9 Nov e from 1	4165.04 98)	30	(98)
Space (98)m= Space 8c. Space Calcu Heat (100)m=	e heatin 4067.9 e heatin pace co llated fo Jan loss rate	g requin 2913.39 g requin oling rec r June, c Feb e Lm (ca 0	ement fc 2113.47 ement in juiremen July and Mar liculated 0	kWh/m August.	2/year	Vh/mon 0 ole 10b Jun	th = 0.02 0 Jul	24 x [(97 0 Tota)m – (95 0 I per year Sep)m] x (4 1140.25 (kWh/year	1)m 2784.99) = Sum(9 Nov	4165.04 (8) =	30	(98)
Space (98)m= Space 8c. S Calcu Heat (100)m= Utilisa	e heatin 4067.9 e heatin pace co ilated fo Jan loss rat 0 ation fac	g requin 2913.39 g requin oling rec r June, , Feb e Lm (ca 0 stor for lo	ement fc 2113.47 ement in July and Mar Ilculated 0 oss hm	kWh/m kWh/m ht August. Apr using 2 0	2/year See Tal May 5°C inter	Wh/mon 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	th = 0.02 0 Jul 3292.25	Aug and extension)m – (95 0 Il per year Sep ernal ter 0	i)m] x (4 1140.25 (kWh/year Oct nperatur 0	1)m 2784.99) = Sum(9) = Nov e from 1 0	4165.04 18)sa_ta = Dec Table 10] 0	30	(98)
Space (98)m= Space 8c. Sj Calcu Heat (100)m= Utilisa (101)m=	e heatin 4067.9 e heatin pace co ulated fo Jan loss ration ation fac	g requin 2913.39 g requin oling rec r June, c Feb e Lm (ca 0 ctor for lo	ement for 2113.47 ement in ulirement July and Mar Iculated 0 pss hm 0	kWh/m t August. Apr using 2 0	² /year See Tal May 5°C inter 0	Wh/mon 0 0 0 0 0 0 0 0 0.97	th = 0.02 0 Jul perature	Aug and exte)m – (95 0 I per year Sep ernal ter)m] x (4 1140.25 (kWh/year Oct	1)m 2784.99) = Sum(9 Nov e from 1	4165.04 98)	30	(98)
Space (98)m= Space 8c. S) Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin 4067.9 e heatin pace co ulated fo Jan loss rat 0 ation fac 0 ul loss, f	g requin 2913.39 g requin oling rec r June, c Feb e Lm (ca 0 ctor for lo 0 mmLm (V	ement for 2113.47 ement in juirement July and Mar liculated 0 pss hm 0 Vatts) =	r each r 832.14 kWh/m t August. Apr using 2 0 0 (100)m 2	Nonth, ki 170.08 2/year See Tal May 5°C inter 0 0 (101)m	Wh/moni 0 0 0 0 0 0 0 0 0.97	th = 0.02 0 Jul perature 3292.25 0.99	4 x [(97 0 Tota Aug and extt 3367.35)m – (95 0 I per year Sep emal ter 0)m] x (4 1140.25 (kWh/year Oct nperatur 0	1)m 2784.99) = Sum(9) = Sum(9 0 0	4165.04 18)	30	(100
Space (98)m= Space 8c. Sj Calcu Heat (100)m= Utilisa (101)m=	e heatin 4067.9 e heatin pace co lated fo Jan loss rat 0 ation fac 0 l loss, f	g requin 2913.39 g requin oling rec r June, c Feb e Lm (ca 0 ctor for lo	ement for 2113.47 ement in ulirement July and Mar Iculated 0 pss hm 0	kWh/m t August. Apr using 2 0	² /year See Tal May 5°C inter 0	Wh/mon 0 0 0 0 0 0 0 0 0.97	th = 0.02 0 Jul 3292.25	4 x [(97 0 Tota Aug and extt 3367.35)m – (95 0 Il per year Sep ernal ter 0	i)m] x (4 1140.25 (kWh/year Oct nperatur 0	1)m 2784.99) = Sum(9) = Nov e from 1 0	4165.04 18)sa_ta = Dec Table 10] 0	30	(98)
Space (98)m= Space 8c. S) Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin 4067.9 e heatin pace co lated fo Jan loss rate 0 ation fac 0 ation fac 0 ation fac 0 s (solar	g requin 2913.39 g requin oling rec r June, c Feb e Lm (ca 0 ctor for lo 0 mmLm (V	ement for 2113.47 ement in July and Mar Ilculated 0 pss hm 0 Vatts) = 0	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 2 0	Nonth, kl 170,08 2/year See Tal May 5°C inter 0 (101)m 0 icable we	Wh/moni 0 0 0 0 0 0 0 0 0 97 4054.47 2 24054.47	th = 0.02 0 Jul 3292.25 0.99 3259.33 egion, se	Aug and extr 3367.35 0.98 3308.46 e Table)m – (95 0 Il per year Sep ernal ter 0 0 10))m] x (4 1140.25 (kWh/year Oct nperatur 0 0	1)m 2784.99) = Sum(S e from 1 0 0	4165.04 18) = = Dec Table 10] 0 0	30	(98) (99) (100 (101 (102
Space (98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin 4067.9 e heatin pace co lated fo Jan loss rate 0 ation fac 0 il loss, f 0 s (solar 0	g requin 2913.39 g requir oling req r June, c Feb e Lm (ca 0 ctor for lo 0 ctor for lo 0 mLm (V 0 gains ca 0	ement fc 2113.47 ement in july and Mar loculated 0 vatts) = 0 loculated 0 loculated 0	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 2 0 for appl 0	Nonth, kl 170,08 2/year 2/year See Tal May 5°C inter 0 (101)m 0 icable we 0	Wh/moni 0 0 0 0 0 0 0 0 0 0.97 4054.47 eather re 5681.54	th = 0.02 0 Jul 3292.25 0.99 3259.33 egion, se 5459.53	24 x ((97 0 Tota and extr 3367.35 0.98 3308.46 te Table 5058.64)m - (95 0 11 per year ernal ter 0 0 0 10) 0)m] x (4 1140.25 (kWh/yeau Oct nperatur 0 0 0	1)m 2784.99) = Sum(9 e from 1 0 0	4165.04 18) = = Dec Table 10; 0 0 0 0	30 30	(100
Space (98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin 4067.9 e heatin pace co ulated fo Jan loss rate 0 ation face 0 ul loss, f 0 ul loss, f 0 s (solar 0 e (solar 0 e (solar) e (so	g require 2913.39 g require oling rec r June, . Feb e Lm (ca e Lm (ca tor for lo 0 tor for lo 0 mLm (V 0 gains ca g require 0 g require	ement for 2113.47 ement in juirement July and Mar ilculated 0 vatts) = 0 lculated 0 ement for	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 3 0 for appl 0 r month,	Nonth, kl 170.08 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 whole c	Wh/moni 0 0 0 0 0 0 0 0 0 0.97 4054.47 eather re 5681.54	th = 0.02 0 Jul 3292.25 0.99 3259.33 egion, se 5459.53	24 x ((97 0 Tota and extr 3367.35 0.98 3308.46 te Table 5058.64)m - (95 0 11 per year ernal ter 0 0 0 10) 0)m] x (4 1140.25 (kWh/yeau Oct nperatur 0 0 0	1)m 2784.99) = Sum(9 e from 1 0 0	4165.04 18) = = Dec Table 10] 0 0	30 30	(98) (99) (100 (101 (102
Space (98)m= Space Calcu Heat (100)m= Utiliss (101)m= Usefu (102)m= Gains (103)m= Space set (1	e heatin 4067.9 e heatin pace co ulated fo Jan loss rate 0 ation face 0 ul loss, f 0 ul loss, f 0 s (solar 0 e coolin 04)m to	g require 2913.39 g require oling rec r June, . Feb e Lm (ca b ctor for lo 0 0 mmLm (V 0 gains ca 0 g require 0 g require 0 g require 0 g rec 0 g rec 0 g rec 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ement fc 2113.47 ement in <u>uirement</u> <u>July and</u> <u>July and</u> <u></u>	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 2 0 for appl 0 r month < 3 × (98	Nonth, kl 170.08 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 whole c	Wh/moni 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	th = 0.02 0 Jul 0erature 3292.25 0.99 3259.33 2gion, se 5459.53 continue	Aug and extu 3367.35 0.98 3308.46 ee Table 5058.64 0005 (kW	m – (95 0 1 per year sep ernal ter 0 0 10) 0 10) 0 10) 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1)m 2784.99) = Sum(s) = Sum(s e from 1 0 0 0 0 0 3)m - (4165.04 18) = Dec Fable 10 0 0 0 102)m J	30 30	(98) (99) (100 (101 (102
Space (98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin 4067.9 e heatin pace co ulated fo Jan loss rate 0 ation face 0 ul loss, f 0 ul loss, f 0 s (solar 0 e coolin 04)m to	g require 2913.39 g require oling rec r June, . Feb e Lm (ca e Lm (ca tor for lo 0 tor for lo 0 mLm (V 0 gains ca g require 0 g require	ement for 2113.47 ement in juirement July and Mar ilculated 0 vatts) = 0 lculated 0 ement for	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 3 0 for appl 0 r month,	Nonth, kl 170.08 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 whole c	Wh/moni 0 0 0 0 0 0 0 0 0 0.97 4054.47 eather re 5681.54	th = 0.02 0 Jul 3292.25 0.99 3259.33 egion, se 5459.53	24 x ((97 0 Tota and extr 3367.35 0.98 3308.46 te Table 5058.64)m - (95 0 11 per year ernal ter 0 10) 0 10) 0 <i>(h)</i> = 0.0)m] x (4 1140.25 (kWh/year 0 0 0 0 24 x [(10 0	1)m 2784.99) = Sum(S Nov e from 1 0 0 0 0 0 0 0 0 0 0 0 0 0	4165.04 18) = Dec Fable 10) 0 0 0 102)m] 0	30]]] x (41)m	(100 (101 (102 (103
Space (98)m= Space Space (100)m= Utilisa (100)m= Usefu (102)m= Space set (1 (104)m=	e heatin 4067.9 e heatin pace co lated for Jan loss ration ation face 0 ation face 1 ation face 1	g require 2913.39 g require oling rec r June, , Feb e Lm (ca 0 ctor for lo ctor for lo 0 ctor for lo 0 gains ca g require 0 g require 0 ctor f lo 0 ctor for	ement fc 2113.47 ement in <u>uirement</u> <u>July and</u> <u>July and</u> <u></u>	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 2 0 for appl 0 r month < 3 × (98	Nonth, kl 170.08 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 whole c	Wh/moni 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	th = 0.02 0 Jul 0erature 3292.25 0.99 3259.33 2gion, se 5459.53 continue	Aug and extu 3367.35 0.98 3308.46 ee Table 5058.64 0005 (kW)m - (95 0 1 per year 2 sep ernal ter 0 10) 0 10) 0 (h) = 0.0 0 Total)m] x (4 1140.25 (kWh/year 0 0 0 24 x [(10 0 1 = Sum(1)m 2784.99) = Sum(9) = Sum(9 0 0 0 0 0 0 0 0 0 0 0 0 0	4165.04 4165.04 18)	30]]] x (41)m	(100 (101 (102 (103 (104
Space (98)m= Space (100)m= Utilisa (101)m= Usefu (102)m= Gainss Space Space (101)m= Coolect	e heatin 4067.9 e heatin pace coo lated fc Jan loss rat 0 ation fac 0 0 s (solar 0 0 0 0 0 0 0 0 0 0 0 0 0	g require 2913.39 g require oling record r June, . Feb e Lm (ca b ctor for lc 0 ctor for lc 0 gains ca 0 g require 0 zero if (0 0 nmLm (V	ement fc 2113.47 ement in Ulrement Uly and Mar Iculated 0 Vatts) = 0 Iculated 0 vatts) = 0 Iculated 0 0 vatts) = 0 104)m < 0	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 2 0 (100)m 2 0 for appl o for appl o for appl 0 0	Nonth, kl 170.08 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 whole c	Wh/moni 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	th = 0.02 0 Jul 0erature 3292.25 0.99 3259.33 2gion, se 5459.53 continue	Aug and extu 3367.35 0.98 3308.46 ee Table 5058.64 ous (kW)m - (95 0 1 per year 2 sep ernal ter 0 10) 0 10) 0 (h) = 0.0 0 Total)m] x (4 1140.25 (kWh/year 0 0 0 0 24 x [(10 0	1)m 2784.99) = Sum(9) = Sum(9 0 0 0 0 0 0 0 0 0 0 0 0 0	4165.04 4165.04 18)	30]]] x (41)m	(100 (101 (102 (103 (104
Space (98)m= Space (100)m= Utilisa (101)m= Usefu (102)m= Gainss Space Space (101)m= Coolect	e heatin 4067.9 e heatin pace coco Jan loss ratt 0 1 loss, 1 6 (solar 0 0 (solar 0 0 (solar) 0 4 fractio 1 dt (solar) 0 4 fractio 1 dt (solar) 1 dt (so	g require 2913.39 g require oling rec r June, , Feb e Lm (ca 0 ctor for lo ctor for lo 0 mmLm (V 0 gains ca g require o zero if (0	ement fc 2113.47 ement in Ulrement Uly and Mar Iculated 0 Vatts) = 0 Iculated 0 vatts) = 0 Iculated 0 0 vatts) = 0 104)m < 0	r each r 832.14 kWh/m t August. Apr using 2 0 (100)m 2 0 (100)m 2 0 for appl o for appl o for appl 0 0	Nonth, kl 170.08 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 whole c	Wh/moni 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	th = 0.02 0 Jul 0erature 3292.25 0.99 3259.33 2gion, se 5459.53 continue	Aug and extu 3367.35 0.98 3308.46 ee Table 5058.64 ous (kW)m - (95 0 1 per year 2 sep ernal ter 0 10) 0 10) 0 (h) = 0.0 0 Total)m] x (4 1140.25 (kWh/year 0 0 0 24 x [(10 0 1 = Sum(1)m 2784.99) = Sum(9) = Sum(9 0 0 0 0 0 0 0 0 0 0 0 0 0	4165.04 4165.04 18)	30]]] x (41)m	(98) (99) (100 (101 (102

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DER WorkSheet: New dwelling design stage

	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)	n						
(107)m=	0	0	0	0	0	288.09	402.55	320.22	0	0	0	0		_
									Total	= Sum(107)	-	1010.86	(10
Space of	cooling	requirer	nent in k	(Wh/m²/	year				(107)) ÷ (4) =			1.67	(10
	~ ~ ~		nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
	heatir		it from s	econdar	y/supple	mentarv	system					1	0	7(20)
			it from m			montary		(202) = 1 -	- (201) =			ł	1	(20)
			ng from		. ,			(204) = (2)		(203)] =			1	(20
			ace heat										375.1	(20
	,			• •	y heating	n system	1. %						0	(20
	,		gy Effici			5 -)	.,						4.05	(20
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space					d above		Jui	Aug	ocp	001	NOV	000	KWIIIIy	-01
	4067.9		2113.47		170.08	0	0	0	0	1140.25	2784.99	4165.04		
(211)m	= {[(98)m x (20	4)]}x1	00 ÷ (20										(21
E	1084.47	776.69	563.44	221.84	45.34	0	0	0	0	303.98	742.46	1110.37		
								Tota	l (kWh/yea	ar) =Sum(2	11) _{15,1012}		4848.6	(21
			econdar		month									
			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								lota	I (KWh/yea	ar) =Sum(2	(15) _{5,1010}	-	0	(21
Water h														
		218.9	ter (calc 229.69	205.61	201.28	179.55	172.15	189.3	189.09	213.22	225.82	242.38		
		ater hea											119.34	(21
	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34		` (21
Fuel for	r water	heating,	kWh/m	onth										
(219)m	= (64)	m x 100) ÷ (217)	m										
(219)m=	208.19	183.43	192.46	172.29	168.66	150.45	144.25	158.62	158.44	178.66	189.22	203.1		
														_
L								Tota	I = Sum(2	19a) ₁₁₂ =			2107.78	(21
			Wh/mor	nth.				Tota	I = Sum(2	19a) ₁₁₂ =		I	2107.78	(21
(221)m		g fuel, k)m÷ (209		nth.	0	71.13	99.4	Tota 79.07	I = Sum(2	19a), = 0	0		2107.78	(21
(221)m	= (107)m÷ (209	9)		0	71.13	99.4	79.07		0	0	0	249.6	
(221)m (221)m=	= (107 0)m+ (209	9)		0	71.13	99.4	79.07	0	0 21) _{6.6} =			249.6	(22
(221)m (221)m= Annual	= (107 0)m+ (209	9)	0		71.13	99.4	79.07	0	0 21) _{6.6} =	0 Wh/year			(22
(221)m ^{(221)m=} Annual Space h	= (107 0 I totals heating)m+ (209	9) 0 ed, main	0		71.13	99.4	79.07	0	0 21) _{6.6} =			249.6 kWh/yea	(22
(221)m (221)m= Annual Space h Water h	= (107 0 I totals heating neating)m+ (209 0 fuel use	9) 0 ed, main d	0		71.13	99.4	79.07	0	0 21) _{6.6} =			249.6 kWh/yea 4848.6	(22
(221)m (221)m= Annual Space I Water h Space c	= (107 0 I totals heating heating cooling)m+ (209 0 fuel use fuel use fuel use	9) 0 ed, main d	0 system	1		99.4	79.07	0	0 21) _{6.6} =			249.6 kWh/yea 4848.6 2107.78	(22
(221)m (221)m= Annual Space I Water h Space c Electrici	= (107 0 I totals heating neating cooling ity for p)m+ (209 0 fuel use fuel use fuel use pumps, f	9) 0 ed, main d ed ans and	0 system electric	1 keep-ho	t		79.07 Tota	0 I = Sum(2:	0 21) _{6.6} =			249.6 kWh/yea 4848.6 2107.78	(22 r
(221)m (221)m= Annual Space I Water h Space c Electrici mecha	= (107 0 I totals heating cooling ity for p anical v)m+ (209 0 fuel use fuel use fuel use pumps, fi entilation	9) 0 ed, main d ed ans and	0 system electric iced, ext	1 keep-ho tract or p	t		79.07 Tota	0 I = Sum(2:	0 21) _{6.6} =			249.6 kWh/yea 4848.6 2107.78	(21) (22) r (23) (23)

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	2516.42 (261
Space heating (secondary)	(215) x	0.519 =	0 (263
Water heating	(219) x	0.519 =	1093.94 (264
Space and water heating	(261) + (262) + (263) +	(264) =	3610.36 (26
Space cooling	(221) x	0.519 =	129.54 (26)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	1209.06 (267
Electricity for lighting	(232) x	0.519 =	561.04 (26)
Total CO2, kg/year		sum of (265)(271) =	5510.01 (27)
Dwelling CO2 Emission Rate		(272) + (4) =	9.09 (27:
El rating (section 14)			89 (274

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1081.01 (232)		User Details:		
	Assessor Name:	Stroma Numb	per:	
Emissions	Software Name: Stroma FSAP 2012	Software Vers	sion: Versio	on: 1.0.5.12
kg CO2/year	F	Property Address: 5B Princ	ce Arthur Road_Be Gre	en
2516.42 (261)	Address :			
	1. Overall dwelling dimensions:			
0 (263)			Av. Height(m)	Volume(m ³)
1093.94 (264)	Basement	176.5 (1a) x	3.1 (2a) =	547.15 (3a
3610.36 (265)	Ground floor	150 (1b) x	3.1 (2b) =	465 (3b
129.54 (266)	First floor	134 (1c) x	2.7 (2c) =	361.8 (3c
1209.06 (267)	Second floor	100 (1d) x	2.5 (2d) =	250 (3d
561.04 (268)	Third floor	45.7 (1e) x	2.45 (2e) =	111.97 (3e
5510.01 (272)	Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1	n) 606.2 (4)		
9.09 (273)	Dwelling volume	(3a)+(3b)+	+(3c)+(3d)+(3e)+(3n) =	1735.91 (5)
89 (274)	2. Ventilation rate:			
	main seconda heating heating	ry other	total	m ³ per hour
	Number of chimneys 0 + 0] + [] = [0 x 40 =	0 (6a
	Number of open flues 0 + 0		0 × 20 =	0 (6b
	Number of intermittent fans		4 × 10 =	40 (7a
	Number of passive vents		0 x 10 =	0 (7b
			0	
	Number of flueless gas fires		0 × 40 =	0 (7c
			Air ch	nanges per hour
	Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40 + (5) =	0.02 (8)
	If a pressurisation test has been carried out or is intended, proceed	ed to (17), otherwise continue fro	m (9) to (16)	
	Number of storeys in the dwelling (ns)			0 (9)
	Additional infiltration		[(9)-1]x0.1 =	0 (10
	Structural infiltration: 0.25 for steel or timber frame of	,	uction	0 (11
	if both types of wall are present, use the value corresponding t deducting areas of openings); if equal user 0.35	o the greater wall area (after		
	If suspended wooden floor, enter 0.2 (unsealed) or 0	0.1 (sealed), else enter 0		0 (12
	If no draught lobby, enter 0.05, else enter 0			0 (13
	Percentage of windows and doors draught stripped			0 (14
	Window infiltration	0.25 - [0.2 x (14) + 10	[0] =	0 (15
	Infiltration rate	(8) + (10) + (11) + (12	2) + (13) + (15) =	0 (16
	Air permeability value, q50, expressed in cubic metro	es per hour per square me	tre of envelope area	5 (17
	If based on air permeability value, then (18) = [(17) + 20]+	(8), otherwise (18) = (16)		0.27 (18
	Air permeability value applies if a pressurisation test has been do	ne or a degree air permeability is	s being used	
	Number of sides sheltered			2 (19
	Shelter factor	(20) = 1 - [0.075 x (19	ə)] =	0.85 (20
		(21) = (18) x (20) =		

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TER WorkSheet: New dwelling design stage

	Infiltration	rate modifie	d for mo	onthly wir	nd sneer	4								
		an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		erage wind				- our	- oui	7.09	000	000		000		
	(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 Fact	or (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		
(3a)	Adjusted in	filtration ra	e (allow	ing for sl	helter an	d wind s	peed) =	(21a) x	(22a)m					
(3b)	0		0.28	0.26	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27		
- (3c)		effective air inical ventila		rate for t	the appli	cable ca	se							
 		air heat pump		ondix N (2	(23b) = (23c	a) x Emv (e	austion //	(5) othe	nwise (23h) = (23a)		Ļ	0	(23a) (23b)
		d with heat rec) - (200)		F	0	(23c)
(3e)		nced mech		-	-					2b)m + (23b) × [*	L (23c) +	-	(230)
		0 0	0	0	0	0	0	0	0	0	0	0		(24a)
(5)	b) If bala	inced mech	anical ve	entilation	without	heat red	overy (N	//V) (24b)m = (22	2b)m + (:	23b)			
	(24b)m=	0 0	0	0	0	0	0	0	0	0	0	0		(24b)
r	c) If who	le house ex	tract ver	ntilation	or positiv	e input	ventilatio	on from o	outside					
(6a)		2b)m < 0.5	<u>, //</u>	<u> </u>	· · ·		<u>``</u>	<u> </u>	<u> </u>	· ·	<u> </u>			
(6b)	(24c)m=		0	0	0	0	0	0	0	0	0	0		(24c)
(7a)		ural ventilati 2b)m = 1, th								0.51				
(7ь)	(24d)m= 0.		0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54		(24d)
(7c)	Effective	air change	rate - e	nter (24a	a) or (24	o) or (24	c) or (24	d) in bo	(25)					
	(25)m= 0.	54 0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54		(25)
our	3. Heat lo	sses and h	eat loss	paramet	er:									
(8)	ELEMEN	IT Gro		Openin m	ngs	Net Ar A ,r		U-valı W/m2		A X U (W/	<)	k-value kJ/m²·K		A X k kJ/K
(9)	Doors					2.4	×	1	=	2.4	٦.			(26)
(10)	Windows '	Type 1				41.9	x1	/[1/(1.4)+	0.04] =	55.55	=			(27)
(11)	Windows '	Type 2				48.7	x1	/[1/(1.4)+	0.04] =	64.56	Ę			(27)
	Windows '	Гуре З				3.2	x1	/[1/(1.4)+	0.04] =	4.24	F			(27)
(12)	Windows '	Type 4				5.2	x1	/[1/(1.4)+	0.04] =	6.89	Ξ			(27)
(13)	Rooflights					11.3	x1	/[1/(1.7) +	0.04] =	19.21	F			(27b)
(14)	Floor					176.5	5 x	0.13	i	22.945	T I			(28)
(15)	Walls Type	e1 418	.7	101.	4	317.3	3 X	0.18	= i	57.11	i F		i F	(29)
(17)	Walls Type	2 7	•	0	=	79	×	0.18	= i	14.22	i F		i F	(29)
(18)	Walls Type	66	3	0	=	66.3	×	0.18	= i	11.93	i F		i F	(29)
	Roof Type	e1 170	.4	11.3	5	159.1	×	0.13	= i	20.68	i F		i F	(30)
(19)	Roof Type	2 40	5	0	-	40.5	×	0.13	= i	5.26	i F		i 🗖	(30)
(20)	Total area	of elements	s, m²			951.4								(31)
(21)														

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TER WorkSheet: New dwelling design stage

nclude bric b	neat los	s, W/K	S (A y	LD.				(26)(30)	+ (32) =				28	2.0	(3)
		Cm = S(0)					((28)	(30) + (33	2) + (32a).	(32e) =		0	3(3)
		parame) - (m.		k l/m²k				tive Value		(328) =	2		3
								acicaly the			TMP in Ta	bla 1f	23	50	(3:
		ad of a de			construct	on are no	known pr	ecisely the	Indicative	values or	INT III Ie	idie II			
erma	l bridge	es : S (L	x Y) cal	culated i	using Ap	pendix I	ĸ						47	⁷ .6	(36
etails c	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									
tal fal	bric he	at loss							(33) +	(36) =			33	1.4	(31
ntilati	ion hea	at loss ca	lculated	monthl	y				(38)m	= 0.33 × (25)m x (5)				
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
l)m=	311.51	310.53	309.58	305.09	304.26	300.35	300.35	299.63	301.85	304.26	305.95	307.73			(38
at tra	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m				
)m=	642.9	641.93	640.98	636.49	635.65	631.75	631.75	631.02	633.25	635.65	637.35	639.12			
											Sum(39)1	o /12=	636	5.49	(39
		meter (H	<i>.</i>							= (39)m +			1		
)m=	1.06	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.05			_
mbor	r of day	/s in mor	th (Tab	(a 1a)						Average =	Sum(40)		1.	05	(40
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
)m=	31				iviciy			Aug	<u> </u>	001	1407	DCC			
			31	30	31	30	31	31	30	31	30	31			(41
~~ L	31	28	31	30	31	30	31	31	30	31	30	31			(41
					31	30	31	31	30	31	30	01			(41
		28 ting ener			31	30	31	31	30	31	30	31 kWh/y	ear:		(41
. Wat sume	er heat ed occu	ting ener upancy, I 9, N = 1	gy requi	rement:							3.	01	ear:		
. Wat sume if TFA	er heat ed occu A > 13.9 A £ 13.9	ting ener	gy requ N + 1.76 x	rement: [1 - exp	(-0.0003	549 x (T	A -13.9)2)] + 0.0	0013 x (9)	kWh/ye	ear:		(42
Wate sume if TFA inual a duce th	er heat ed occu A > 13.9 A £ 13.9 averag	ting ener upancy, I 9, N = 1 9, N = 1 je hot wa a/ average	gy requive v + 1.76 x hot water	rement: [1 - exp ge in litre usage by :	(-0.0003 es per da 5% if the d	49 x (Thay Vd,av	FA -13.9 erage = designed t)2)] + 0.0 (25 x N)	0013 x (+ 36	TFA -13.	9) 118	kWh/y	ear:		(42
. Wat sume if TFA if TFA inual a duce th	er heat ed occu A > 13.9 A £ 13.9 averag he annua that 125	ting ener upancy, I 9, N = 1 9, N = 1 le hot wa al average litres per p	gy requiver y + 1.76 x ater usage hot water person per	rement: [1 - exp ge in litre usage by : day (all w	(-0.0003 es per da 5% if the a vater use, l	49 x (Th ay Vd,av welling is hot and co	FA -13.9 erage = designed is)2)] + 0.0 (25 x N) o achieve	0013 x (+ 36 a water us	TFA -13.	9) 3.	kWh/ye 53 3.04	ear:		(42
. Wat sume if TFA if TFA inual : duce th t more :	er heat ed occu A > 13.9 A £ 13.9 averag he annue that 125 Jan	ting ener upancy, J 9, N = 1 9, N = 1 ge hot wa al average litres per j Feb	gy requ y + 1.76 x hter usag hot water berson per Mar	rement: [1 - exp ge in litre usage by : day (all w Apr	(-0.0003 es per da 5% if the o vater use, l May	449 x (The average of the second seco	A -13.9 erage = designed i ld) Jul)2)] + 0.1 (25 x N) o achieve Aug	0013 x (+ 36	TFA -13.	9) 118	kWh/ye	ear:		(42
. Wat ssume if TFA in ual : duce th t more :	er heat ed occu A > 13.9 A £ 13.9 averag he annue that 125 Jan r usage in	ting energy, upancy, J 9, N = 1 9, N = 1 lite hot wa al average litres per p Feb n litres per	gy requ + 1.76 x hter usag hot water berson per Mar day for es	rement: [1 - exp ge in litre usage by : day (all w Apr ach month	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa	449 x (T ay Vd,av Iwelling is not and co Jun ctor from T	=A -13.9 erage = designed i Id) Jul Table 1c x)2)] + 0.1 (25 x N) o achieve Aug (43)	0013 x (+ 36 a water us	TFA -13. se target o Oct	3. 9) 118 Nov	kWh/ye 53 3.04 Dec	ear:		(42
. Wat ssume if TFA in ual : duce th t more :	er heat ed occu A > 13.9 A £ 13.9 averag he annue that 125 Jan	ting ener upancy, J 9, N = 1 9, N = 1 ge hot wa al average litres per j Feb	gy requ y + 1.76 x hter usag hot water berson per Mar	rement: [1 - exp ge in litre usage by : day (all w Apr	(-0.0003 es per da 5% if the o vater use, l May	449 x (The average of the second seco	A -13.9 erage = designed i ld) Jul)2)] + 0.1 (25 x N) o achieve Aug	0013 x (1 + 36 a water us Sep 115.68	TFA -13. se target o Oct 120.4	3. 9) 118 Nov	kWh/yr 53 3.04 Dec 129.84]		(41 (42 (43
. Wate source if TFA if TFA innual s duce th t more s duce th t more s	er heat ad occu A > 13.9 A £ 13.9 averag he annue that 125 Jan rusage ii 129.84	ting energy pancy, 1 9, N = 1 9, N = 1 le hot wa a verage litres per litres per n litres per 125.12	gy requ + 1.76 x tter usag hot water berson per Mar day for ee 120.4	rement: [1 - exp ge in litre usage by : day (all w Apr ich month 115.68	(-0.0003 es per da 5% if the da vater use, l May Vd,m = fa 110.96	449 x (Tr ay Vd,av Iwelling is not and co Jun ctor from 1 106.23	FA -13.9 erage = designed t (d) Jul Table 1c x 106.23)2)] + 0.1 (25 x N) o achieve Aug (43) 110.96	0013 x (+ 36 a water us Sep 115.68	TFA -13. se target o Oct 120.4 Total = Su	3. 9) 118 Nov 125.12 m(44)	kWh/ye 53 3.04 Dec 129.84]	6.45	(42
. Wate source if TFA if TFA if TFA annual : duce th t more : t water i)m= [ergy co	er heat ed occu A > 13.9 A £ 13.9 A £ 13.9 averag he annue that 125 Jan r usage in 129.84 ontent of	ting energy upancy, J 9, N = 1 9, N = 1 le hot was al average litres per Feb n litres per 125.12	gy required to the second seco	rement: [1 - exp ge in litre usage by day (all w Apr ich month 115.68	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa 110.96	449 x (Tr ay Vd, av weelling is not and co Jun ctor from 1 106.23	FA -13.9 erage = designed i ld) Jul Table 1c x 106.23 m x nm x D)2)] + 0.1 (25 x N) o achieve (43) 110.96	00013 x (+ 36 a water us Sep 115.68	TFA -13. se target o Oct 120.4 Total = Su nth (see Ta	3. 9) 118 Nov 125.12 m(44)	kWh/yr 53 3.04 Dec 129.84 c, 1d)]	6.45	(42
. Wate source if TFA if TFA if TFA nual : duce th t more : () t water i)m= [ergy co	er heat ad occu A > 13.9 A £ 13.9 averag he annue that 125 Jan rusage ii 129.84	ting energy pancy, 1 9, N = 1 9, N = 1 le hot wa a verage litres per litres per n litres per 125.12	gy requ + 1.76 x tter usag hot water berson per Mar day for ee 120.4	rement: [1 - exp ge in litre usage by : day (all w Apr ich month 115.68	(-0.0003 es per da 5% if the da vater use, l May Vd,m = fa 110.96	449 x (Tr ay Vd,av Iwelling is not and co Jun ctor from 1 106.23	FA -13.9 erage = designed t (d) Jul Table 1c x 106.23)2)] + 0.1 (25 x N) o achieve Aug (43) 110.96	00013 x (1 + 36 a water us Sep 115.68 0 kWh/mor 134.98	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31	3. 9) 111 Nov 125.12 m(44)	kWh/yr 53 3.04 Dec 129.84 c, 1d) 186.47	141		(42 (43
. Wate sume if TEA if TFA in rual : duce th t more t ()m= ergy cc i)m=	er heat ed occu A > 13.9 A £ 13.9 averag he annue that 125 Jan rusage in 129.84 ontent of 192.55	ting energy upancy, J 9, N = 1 9, N = 1 le hot was al average litres per Feb n litres per 125.12	gy requ + 1.76 x tter usag hot water berson per Mar day for ee 120.4 used - calo 173.78	rement: [1 - exp ge in litre usage by : day (all w Apr sch month 115.68 culated mo 151.51	(-0.0003 es per da 5% if the a syster use, l May Vd,m = fa 110.96 onthly = 4. 145.37	449 x (T ay Vd, av weelling is not and co Jun ctor from 1 106.23 190 x Vd, r 125.45	-A -13.9 erage = designed ti ld) Jul Table 1c x 106.23 n x nm x D 116.24)2)] + 0.1 (25 x N) o achieve (43) 110.96 17m / 3600 133.39	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31	3. 9) 118 Nov 125.12 m(44)	kWh/yr 53 3.04 Dec 129.84 c, 1d) 186.47	141	6.45	(42 (43
. Wate if TFA if TFA if TFA if TFA more to compare to t water if wat	er heat ed occu A > 13.9 A £ 13.9 averag he annue that 125 Jan rusage in 129.84 ontent of 192.55	ting erier upancy, I 9, N = 1 9, N = 1 lie hot was a average litres per Feb n litres per 125.12 hot water 168.41	gy requ + 1.76 x tter usag hot water berson per Mar day for ee 120.4 used - calo 173.78	rement: [1 - exp ge in litre usage by : day (all w Apr sch month 115.68 culated mo 151.51	(-0.0003 es per da 5% if the a syster use, l May Vd,m = fa 110.96 onthly = 4. 145.37	449 x (T ay Vd, av weelling is not and co Jun ctor from 1 106.23 190 x Vd, r 125.45	-A -13.9 erage = designed ti ld) Jul Table 1c x 106.23 n x nm x D 116.24)2)] + 0.1 (25 x N) o achieve (43) 110.96 17m / 3600 133.39	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31	3. 9) 111 Nov 125.12 m(44)	kWh/yr 53 3.04 Dec 129.84 c, 1d) 186.47	141		(42 (43 (44
. Wate if TFA if	er heal ed occl A > 13.9 A £ 13.9 he annua that 125 Jan rusage in 129.84 ontent of 192.55	ting energy pancy, J 9, N = 1 9, N = 1 9, N = 1 10, N = 1 10	y requ + 1.76 x tter usag hot water berson per Mar day for es 120.4 used - cale 173.78 ag at point	rement: [1 - exp ge in litre usage by : day (all w Apr ich month 115.68 culated model 151.51 of use (note)	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa 110.96 onthly = 4. 145.37	449 x (Tr ay Vd, av welling is not and co Jun totor from 106.23 190 x Vd,r 125.45 storage),	=A -13.9 erage = designed ti dy Jul Table 1c x 106.23 m x nm x D 116.24 enter 0 in)2)] + 0.1 (25 x N) o achieve (43) 110.96 07m / 3600 133.39 boxes (46)	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98) to (61)	TFA -13. se target o Oct 120.4 Total = Su 157.31 Total = Su	3. 9) 1111 Nov 125.12 m(44) () = bbles 1b, 1 171.72 m(45) () =	kWh/yr 53 3.04 129.84 c, 1d) 186.47	141		(42 (43 (44
. Wate ssume if TFA if TFA	er heat docctu A > 13.3 A £ 13.9 average he annue that 125 Jan usage in 129.84	ting energy pancy, J 9, N = 1 9, N = 1 9, N = 1 10, N = 1 10	ey requ + 1.76 x ter usag hot water berson per Mar day for ee 120.4 used - calo 173.78 og at point 26.07	rement: [1 - exp ge in litre usage by : day (all w Apr the month 115.68 culated me 151.51 of use (no 22.73	(-0.0003 es per da 5% if the o rater use, l May Vd,m = fa 110.96 onthly = 4. 145.37 o hot water 21.81	449 x (T ay Vd, av welling is not and co Jun totor from 1 106.23 190 x Vd,r 125.45 storage), 18.82	=A -13.9 erage = designed i ld) Jul Table 1c x 106.23 m x nm x E 116.24 enter 0 in 17.44)2)] + 0.1 (25 x N) o achieve (43) 110.96 7 <i>Tm</i> / 3600 133.39 boxes (46 20.01	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98 0 to (61) 20.25	TFA -13. se target o Oct 120.4 Total = Su 157.31 Total = Su 23.6	3. 9) 118 Nov 125.12 m(44) 171.72 m(45) 25.76	kWh/yr 53 3.04 129.84 c, 1d) 186.47	141		(42 (43 (44 (44 (45
. Wate sume if TFA if TFA	er heat docct. A > 13.3 A £ 13.8 La A £ 13.8 Jan 129.84 Jan 129.84 Jan 192.55 Jan 192.55 Jan 192.55 Jan 192.55 Jan 192.55 Jan 192.55	ting energy pancy, I 9, N = 1 9, N = 1 1 e hot was a average litres per p 125.12 hot water 125.12 hot water 168.41 25.26 loss: e (litres) meating a	gy required by required by required by required by the second by the sec	rement: [1 - exp ge in litre usage by : day (all w Apr ich month 115.68 culated mo 22.73 of use (no 22.73 og any so nk in dw	(-0.0003 es per da 5% if the a vater use, l May Vd.m = fa 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e	449 x (T ay Vd, av welling is not and co Jun 106.23 190 x Vd,r 125.45 storage), 18.82 WHRS nter 110	=A -13.9 erage = designed i (d) Jul Table 1c x 106.23 m x nm x E 116.24 enter 0 in 17.44 storage 0 litres in)2)] + 0.1 (25 x N) o achieve (43) 110.96 (7m / 3600 133.39 boxes (46) 20.01 within sa (47)	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98 0 to (61) 20.25 ame ves	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31 Total = Su 23.6 sel	3. 9) 118 Nov 125.12 m(44) 125.12 m(44) 171.72 m(45) 25.76	kWh/yr 53 3.04 Dec 129.84 c, 1d) 186.47 27.97	141		(42 (43) (44) (44) (48)
I Wate if TFA if TFA	er heal A > 13.24 Jan 129.84 Dontent of 192.55 Incous w 28.88 ktorage e volum munity h ise if no	Ing energy, $p_{N} = 1$ $p_{N} = 1$ $p_{$	gy required by required by required by required by the second by the sec	rement: [1 - exp ge in litre usage by : day (all w Apr ich month 115.68 culated mo 22.73 of use (no 22.73 og any so nk in dw	(-0.0003 es per da 5% if the a vater use, l May Vd.m = fa 110.96 onthly = 4. 145.37 o hot water 21.81 olar or W velling, e	449 x (T ay Vd, av welling is not and co Jun 106.23 190 x Vd,r 125.45 storage), 18.82 WHRS nter 110	=A -13.9 erage = designed i (d) Jul Table 1c x 106.23 m x nm x E 116.24 enter 0 in 17.44 storage 0 litres in)2)] + 0.1 (25 x N) o achieve (43) 110.96 (7m / 3600 133.39 boxes (46) 20.01 within sa (47)	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98 0 to (61) 20.25 ame ves	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31 Total = Su 23.6 sel	3. 9) 118 Nov 125.12 m(44) 125.12 m(44) 171.72 m(45) 25.76	kWh/yr 53 3.04 Dec 129.84 c, 1d) 186.47 27.97	141		(42 (43) (44) (44) (48)
• Wate sume of TFA if twater if water if water	er heal doccl A > 13.8 Haveraggere annuer Jan usage is usage is 129.84 192.55 Intecus w 28.88 itorage volum uunity h ise if no torage	ting energy ipancy, J, N = 1 9, N = 1 9, N = 1 1 e hot wal average ives per provide a start n litres per 125.12 hot water 125.26 hot water 25.26 loss: e e (litres) averating a stored loss:	y requ + 1.76 x + 1.7	rement: [1 - exp ge in litra susge by : usage by : usage by : usage by : day (all w Apr ch month 115.68 culated month 115.68 culated month 115.61 culated month 115.63 culated month 115.63 c	(-0.0003 ess per de 5% if the a c 5% if the a c 110.96 145.37 21.81 21.81 21.81 21.81 21.81	449 x (Ti vy Vd, av welling is that and co Jun teter from 7: 106.23 190 x Vd,r 125.45 190 x Vd,r 125.45 18.82 WWHRS niter 110 C	=A -13.9 erage = (a) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in neous co)2)] + 0.1 (25 x N) o achieve (43) 110.96 (7m / 3600 133.39 boxes (46) 20.01 within sa (47)	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98 0 to (61) 20.25 ame ves	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31 Total = Su 23.6 sel	9) 110 Nov 125.12 125.12 125.12 125.12 125.12 171.72 25.76 25.76 (kWh/y/ kWh/y/ 553 3.04 Dec c, 1d) 186.47 27.97 150	141		(42 (43 (44 (44 (47
. Watt if TFA if TFA	er heal ded occl A > 13.9 A > 13.9	Ing energy, $p_{N} = 1$ $p_{N} = 1$ $p_{$	+ 1.76 x v + 1.76 x v - 100 x v	rement: [1 - exp ge in litre usage by : usage by :	(-0.0003 ess per de 5% if the a de 110.96 May Vd,m = fa 110.96 anthly = 4. 145.37 21.81 21.81 20.81 or M	449 x (Ti vy Vd, av welling is that and co Jun teter from 7: 106.23 190 x Vd,r 125.45 190 x Vd,r 125.45 18.82 WWHRS niter 110 C	=A -13.9 erage = (a) Jul Table 1c x 106.23 n x nm x E 116.24 enter 0 in 17.44 storage litres in neous co)2)] + 0.1 (25 x N) o achieve (43) 110.96 (7m / 3600 133.39 boxes (46) 20.01 within sa (47)	0013 x (+ 36 a water us Sep 115.68 0 kWh/mor 134.98 0 to (61) 20.25 ame ves	TFA -13. se target o Oct 120.4 Total = Su th (see Ta 157.31 Total = Su 23.6 sel	3. 9) 1188 Nov 125.12 125.12 125.12 125.76 25.76 25.76 47)	kWh/yr 53 3.04 Dec 129.84 c, 1d) 186.47 27.97	141		(42

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0 0 1.02 Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (50)m= 13.16.4 [2.6.58] 3.16.4 [3.6.2] 3.16.4 (\$7)m= 31.64 28.58 31.64 30.62 30.62
 Primary circuit loss (annual) from Table 3
 0

 Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m
 (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

 (69)m=
 23.26
 21.01
 23.26
 22.51
 23.26
 22.51
 23.26
 22.51
 23.26
 (58)
 Combi loss calculated for each month (61)m = (60) * 365 * (41)m

 (61)m=
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 <td (46)m + (57)m + (59)m + (61)m 224.85 241.38 1.28 178.58 171,15 188.3 188.12 212.22 224.85 241.38 Output from water heater (apprual)
 Heat gains from water heating, kWh/month 0.25 ' [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

 (65)m*
 [107.95
 95.67
 101.71
 92.88
 92.26
 84.22
 82.28
 87.39
 96.23
 90.6
 105.93
 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 61.21 54.37 44.21 33.47 25.02 21.12 22.83 29.67 39.82 50.56 50.01 62.91
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

 (68)m*
 675.49
 682.5
 664.84
 627.24
 579.77
 535.15
 505.35
 498.34
 516
 553.61
 601.08
 645.69

 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

 (69)m=
 40.65
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 Pumps and fans gains (Table 5a)

 (70)m=
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 Losses e.g. evaporation (negative values) (Table 5)

 (71)m=
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TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (4 b) If manufacturer's declared cylinder loss factor is not known:

b) in manufacture a section software room to be a section of the New Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a

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(48) x (49) =

1.02

0

(50)

(51)

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TER WorkSheet: New dwelling design stage

(72)m=	145.09	142.37	136.7	Τ	129.01 124	.01	11	6.97 110.99	118	.65 121.38	129.34	138.34	142.38		(72
Total i	nternal	gains =						(66)m + (67)m	n + (6l	3)m + (69)m + (70)m +	(71)m + (72)	m		
73)m=	960.75	958.19	924.7	1	868.66 807	.75	75	2.2 718.11	725	.61 756.15	812.46	877.38	929.93]	(73
6. Sol	ar gains	s:													
Solar g	ains are c	alculated	using so	lar	flux from Table	6a a	and a	associated equa	tions	to convert to the	e applic	able orientati	on.		
Orienta		Access F able 6d	actor		Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
lorthea	ast 0.9x	0.77		x	3.2		×	11.28	×	0.63	×	0.7	=	11.03	(75
Northea	ast <mark>0.9x</mark>	0.77		x	3.2		×[22.97	×	0.63	×	0.7	=	22.46	(75
Northea	ast <mark>0.9x</mark>	0.77		x	3.2		× [41.38	×	0.63	×	0.7	=	40.47	(75
Vorthea	ast <mark>0.9x</mark>	0.77		x	3.2		× [67.96	×	0.63	×	0.7	=	66.46	(75
Northea	ast <mark>0.9x</mark> [0.77		x	3.2		× [91.35	×	0.63	×	0.7	=	89.33	(75
Northea	ast <mark>0.9x</mark>	0.77		x	3.2		× [97.38	×	0.63	×	0.7	=	95.24	(75
Northea	L	0.77		x	3.2		×[91.1	×	0.63	×	0.7	=	89.09	(75
Northea		0.77		x	3.2		× [72.63	×	0.63	×	0.7	=	71.03	(75
Northea	L	0.77		×	3.2		× [50.42	×	0.63	x	0.7	-	49.31	(75
Northea	- L	0.77		x	3.2		×	28.07	×	0.63	x	0.7	-	27.45	(75
Northea	- L	0.77		x	3.2		×	14.2	×	0.63	x	0.7	=	13.88	(75
Northea	L	0.77		x	3.2		×	9.21	×	0.63	x	0.7	-	9.01	(75
Southea	L	0.77		x	48.7		×[36.79	×	0.63	x	0.7	-	547.62	(77
Southea	L .	0.77		x	48.7		×	62.67	x	0.63	x	0.7	=	9 <mark>32.79</mark>	(77
Southea	ast 0.9x	0.77		x	48.7		×	85.75	×	0.63	x	0.7	=	1276.29	(77
Southea	L	0.77		×	48.7		×	106.25	×	0.63	×	0.7	=	1581.38	(77
Southea		0.77		x	48.7		×	119.01	×	0.63	×	0.7	=	1771.28	(77
Southea	L	0.77		x	48.7		×	118.15	×	0.63	×	0.7	=	1758.47	(77
Southea		0.77		x	48.7		× [113.91	×	0.63	×	0.7	=	1695.35	(77
Southea	L	0.77		x	48.7		× [104.39	×	0.63	×	0.7	=	1553.68	(77
Southea	L	0.77		x	48.7		× [92.85	×	0.63	×	0.7	=	1381.95	(77
Southea		0.77		x	48.7		× [69.27	×	0.63	×	0.7	=	1030.93	(77
Southea		0.77		x	48.7		× [44.07	×	0.63	×	0.7	=	655.92	(77
Southea	5	0.77		x	48.7]	× [31.49	×	0.63	×	0.7	=	468.64	(77
Southw	L	0.77		x	41.9]	× [36.79		0.63	×	0.7	=	471.15	(79
Southw	L	0.77		x	5.2]	× [36.79		0.63	×	0.7	=	58.47	(79
Southw	L	0.77		x	41.9		× [62.67		0.63	×	0.7	=	802.55	(79
Southw	est <mark>o.9x</mark>	0.77		x	5.2		× [62.67		0.63	×	0.7	=	99.6	(79
Southw	est <mark>o.9x</mark>	0.77		x	41.9		× [85.75		0.63	×	0.7	=	1098.08	(79
Southw	L	0.77		x	5.2		× [85.75]	0.63	×	0.7	=	136.28	(79
Southw	est <mark>o.9x</mark> [0.77		x	41.9		× [106.25]	0.63	×	0.7	=	1360.57	(79
Southw	est <mark>o.9x</mark>	0.77		x	5.2		×Г	106.25	1	0.63	x	0.7	=	168.85	(79

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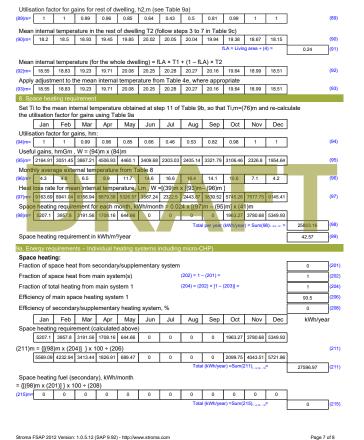
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TER WorkSheet: New	dwelling design stage
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Southwest0.9x	0.77	x	41.9		× [119.01]	0.63	×	0.7	-	1523.95	(79)
Southwest0.9x	0.77	x	5.2		×	119.01]	0.63	×	0.7	-	189.13	(79)
Southwest0.9x	0.77	x	41.9		×	118.15]	0.63	×	0.7	-	1512.93	(79)
Southwest0.9x	0.77	x	5.2		×	118.15]	0.63	×	0.7	-	187.76	(79)
Southwest0.9x	0.77	x	41.9		×	113.91]	0.63	×	0.7	-	1458.63	(79)
Southwest0.9x	0.77	×	5.2		×Ē	113.91	i	0.63	٦× ٦	0.7	-	181.02	(79)
Southwest0.9x	0.77	x	41.9		×	104.39]	0.63	×	0.7	-	1336.74	(79)
Southwest0.9x	0.77	x	5.2		×	104.39]	0.63	×	0.7	-	165.9	(79)
Southwest0.9x	0.77	x	41.9		×	92.85]	0.63	×	0.7	-	1188.99	(79)
Southwest0.9x	0.77	x	5.2		×	92.85]	0.63	×	0.7	-	147.56	(79)
Southwest0.9x	0.77	x	41.9		×	69.27]	0.63	×	0.7	-	886.98	(79)
Southwesto.9x	0.77	×	5.2		×Ē	69.27	i	0.63	× ٦	0.7		110.08	(79)
Southwesto.9x	0.77	×	41.9		×Ē	44.07	i	0.63	× ٦	0.7		564.33	(79)
Southwesto.9x	0.77	×	5.2		×Ī	44.07	i	0.63	×	0.7		70.04	(79)
Southwest0.9x	0.77	×	41.9		×Ī	31.49	i	0.63	٦×	0.7	=	403.21	(79)
Southwesto.9x	0.77	×	5.2		×Ī	31.49	i	0.63	٦×	0.7	=	50.04	(79)
Rooflights 0.9x	1	×	11.3		×Ī	26	Í x	0.63	٦×	0.7	-	116.61	(82)
Rooflights 0.9x	1	×	11.3		×	54	x	0.63	×	0.7	-	242.19	(82)
Rooflights 0.9x	1	×	11.3	=	׾	96	x	0.63	٦x	0.7	=	430.56	(82)
Rooflights 0.9x	1	×	11.3		×Ī	150	i 🖌	0.63	٦x	0.7	-	672.75	(82)
Rooflights 0.9x	1	×	11.3		×	192	x	0.63	٦×	0.7	-	861.11	(82)
Rooflights 0.9x	1	×	11.3		×Ē	200	x	0.63	٦×	0.7	- i -	896.99	(82)
Rooflights 0.9x	1	T x	11.3	7	×	189	×	0.63	٦×	0.7	- ۲	847.66	(82)
Rooflights 0.9x	1	×	11.3		×Ē	157	į 🗴	0.63	٦×	0.7	- ۲	704.14	(82)
Rooflights 0.9x	1	×	11.3		׾	115	į 🗴	0.63	٦x	0.7	- ۲	515.77	(82)
Rooflights 0.9x	1	×	11.3		×Ī	66	į 🗴	0.63	٦×	0.7	- ۲	296.01	(82)
Rooflights 0.9x	1	×	11.3		×Ī	33	x	0.63	٦x	0.7	- ۲	148	(82)
Rooflights 0.9x	1	×	11.3		×Ī	21	İx	0.63	٦× ٦	0.7	-	94.18	(82)
								•	-			-	
Solar gains in	watts, cal	culated	for each m	onth			(83)n	n = Sum(74)m .	(82)m			_	
(83)m= 1204.88		2981.67		34.81		51.4 4271.76	383	1.48 3283.57	2351.	15 1452.17	1025.0	9	(83)
Total gains – i			· / ·	<u> </u>	÷							_	
(84)m= 2165.63	3057.77	8906.37	4718.67 52	42.55	520	3.59 4989.87	455	7.09 4039.73	3163.	2329.55	1955.0	2	(84)
7. Mean inter	nal tempe	rature	(heating se	asor	ı)								
Temperature	during he	ating p	eriods in th	e livi	ng a	rea from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for gai	ns for li	iving area,	h1,m	ı (se	e Table 9a)	_					_	
Jan	Feb	Mar		May	-	un Jul	-	ug Sep	Oc	-	Dec		
(86)m= 1	1	0.99	0.97 0	.89	0.	72 0.55	0.6	62 0.88	0.99	1	1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													
(87)m= 19.65	19.85	20.15	20.51 2	0.8	20	.96 20.99	20.	98 20.87	20.4	5 19.97	19.62		(87)
Temperature	during he	ating p	eriods in re	st of	dwe	lling from Ta	able	9, Th2 (°C)					
(88)m= 20.03		20.04		0.04		.05 20.05	20		20.0	20.04	20.04	7	(88)
L												_	

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TER WorkSheet: New dwelling design stage

TER WorkSheet: New dwelling design stage

Water heating
 Water nearing
 Output from water heater (calculated above)
 Image: Calculated above in the calc Efficiency of water heater 2896.45 Annual totals Space heating fuel used, main system 1 kWh/year kWh/year 27596.97 2896.45 Water heating fuel used Electricity for pumps, fans and electric keep-hot 30 45 central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year sum of (230a)...(230g) = Electricity for lighting pace and water heating 0.519 Electricity for pumps, fans and electric keep-hot (231) x 561.04 (2) 7186.54 (2) Electricity for lighting (232) x Total CO2, kg/year sum of (265)...(271) = 17.83 (273) TER =

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5B PRINCE ARTHUR ROAD HAMPSTEAD

Appendix A4 **Energy Performance Certificate (EPC)**.

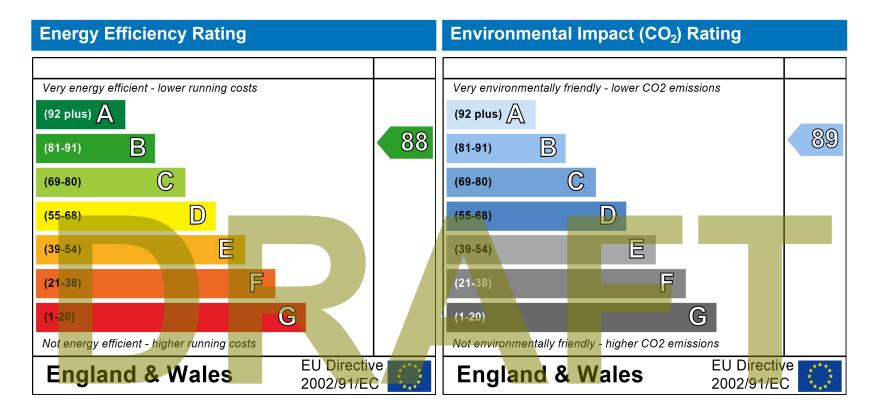
A4 | Energy Performance Certificate (EPC) of the Proposed Dwelling

Predicted Energy Assessment

Dwelling type: Date of assessment: Produced by: Total floor area:

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



Detached House 10 December 2020 Stroma Certification 606.2 m²

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

A4 | Energy Performance Certificate (EPC) of the Existing Dwelling

Energy Performance Certificate

5b, Prince Arthur Road, LONDON, NW3 6AX

Dwelling type:	Detached house	Reference number:	0264-2826-7223-9601-9605
Date of assessment:	06 February 2019	Type of assessment:	RdSAP, existing dwelling
Date of certificate:	12 February 2019	Total floor area:	236 m²

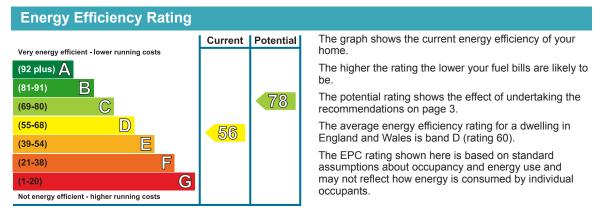
Use this document to:

Compare current ratings of properties to see which properties are more energy efficient

• Find out how you can save energy and money by installing improvement measures

Estimated energy	£ 6,339					
Over 3 years you	£ 2,601					
Estimated energy costs of this home						
	Current costs	Potential costs	Potential future savings			
Lighting	£ 561 over 3 years	£ 339 over 3 years				
Heating	£ 5,118 over 3 years	£ 3,147 over 3 years	You could			
Hot Water	£ 660 over 3 years	£ 252 over 3 years	save £ 2,601			
	Totals £ 6,339	£ 3,738	over 3 years			

These figures show how much the average household would spend in this property for heating, lighting and hot water and is not based on energy used by individual households. This excludes energy use for running appliances like TVs, computers and cookers, and electricity generated by microgeneration.



Top actions you can take to save money and make you		
Recommended measures Indi	cative cost	Typical savings over 3 years

1 Flat roof or sloping ceiling insulation	£850 - £1,500	£ 549
2 Room-in-roof insulation	£1,500 - £2,700	£ 372
3 Cavity wall insulation	£500 - £1,500	£ 867

See page 3 for a full list of recommendations for this property.

To find out more about the recommended measures and other actions you could take today to save money, visit www.gov.uk/energy-grants-calculator or call **0300 123 1234** (standard national rate). The Green Deal may enable you t make your home warmer and cheaper to run.

Page 1 of 4

b, Prince Arthur Road, LONDON, NW3 6AX 2 February 2019 RRN: 0264-2826-7223-9601-9605

Element	Description	Energy Efficiency
Walls	Cavity wall, as built, no insulation (assumed)	★★☆☆☆
Roof	Pitched, limited insulation (assumed)	★☆☆☆
	Roof room(s), limited insulation (assumed)	$\bigstar \bigstar \pounds \clubsuit \pounds$
Floor	Suspended, no insulation (assumed)	-
Windows	Fully double glazed	★★★☆☆
Main heating	Boiler and radiators, mains gas	★★★★ ☆
Main heating controls	Programmer, room thermostat and TRVs	★★★ ☆
Secondary heating	None	-
Hot water	From main system	★★★★ ☆
Lighting	Low energy lighting in 35% of fixed outlets	★★★ ☆☆

Current primary energy use per square metre of floor area: 255 kWh/m² per year

The assessment does not take into consideration the physical condition of any element. 'Assumed' means that the insulation could not be inspected and an assumption has been made in the methodology based on age and type of construction.

See addendum on the last page relating to items in the table above.

Low and zero carbon energy sources

Low and zero carbon energy sources are sources of energy that release either very little or no carbon dioxide into the atmosphere when they are used. Installing these sources may help reduce energy bills as well as cutting carbon. There are none provided for this home.

Your home's heat demand

iQ-Engine v93.0.1.1 (SAP 9.93)

For most homes, the vast majority of energy costs derive from heating the home. Where applicable, this table shows the energy that could be saved in this property by insulating the loft and walls, based on typical energy use (shown within brackets as it is a reduction in energy use).

Heat demand	Existing dwelling	Impact of loft insulation	Impact of cavity wall insulation	Impact of solid wall insulation
Space heating (kWh per year)	36,870	N/A	(6,150)	N/A
Water heating (kWh per year)	4,861			

You could receive Renewable Heat Incentive (RHI) payments and help reduce carbon emissions by replacing your existing heating system with one that generates renewable heat, subject to meeting minimum energy efficiency requirements. The estimated energy required for space and water heating will form the basis of the payments. For more information, search for the domestic RHI on the www.gov.uk website.

Energy Performance Certificate

b. Prince Arthur Road, LONDON, NW3 6AX

2 February 2019 RRN: 0264-2826-7223-9601-9605

Energy Performance Certificate

Recommendations

The measures below will improve the energy performance of your dwelling. The performance ratings after improvements listed below are cumulative; that is, they assume the improvements have been installed in the order that they appear in the table. Further information about the recommended measures and other simple actions you could take today to save money is available at www.gov.uk/energy-grants-calculator. Before installing measures, you should make sure you have secured the appropriate permissions, where necessary. Such permissions might include permission from your landlord (if you are a tenant) or approval under Building Regulations for certain types of work

Recommended measures	Indicative cost	Typical savings per year	Rating after improvement
Flat roof or sloping ceiling insulation	£850 - £1,500	£ 183	D60
Room-in-roof insulation	£1,500 - £2,700	£ 124	D62
Cavity wall insulation	£500 - £1,500	£ 289	D68
Floor insulation (suspended floor)	£800 - £1,200	£ 104	C71
Increase hot water cylinder insulation	£15 - £30	£ 50	C72
Low energy lighting for all fixed outlets	£110	£ 64	C73
Solar water heating	£4,000 - £6,000	£ 52	C74
Solar photovoltaic panels, 2.5 kWp	£5,000 - £8,000	£ 303	C78

Alternative measures

There are alternative measures below which you could also consider for your home.

External insulation with cavity wall insulation

Opportunity to benefit from a Green Deal on this property

Green Deal Finance allows you to pay for some of the cost of your improvements in instalments under a Green Deal Plan (note that this is a credit agreement, but with instalments being added to the electricity bill for the property). The availability of a Green Deal Plan will depend upon your financial circumstances. There is a limit to how much Green Deal Finance can be used, which is determined by how much energy the improvements are estimated to save for a 'typical household'.

You may be able to obtain support towards repairs or replacements of heating systems and/or basic insulation measures, if you are in receipt of qualifying benefits or tax credits. To learn more about this scheme and the rules about eligibility, call the Energy Saving Advice Service on 0300 123 1234 for England and Wales.

b, Prince Arthur Road, LONDON, NW3 6AX

2 February 2019 RRN: 0264-2826-7223-9601-9605

Energy Performance Certificate

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by Quidos. You can obtain contact details of the Accreditation Scheme at www.guidos.co.uk.

A copy of this certificate has been lodged on a national register as a requirement under the Energy Performance of Buildings Regulations 2012 as amended. It will be made available via the online search function at www.epcregister.com. The certificate (including the building address) and other data about the building collected during the energy assessment but not shown on the certificate, for instance heating system data, will be made publicly available at www.opendatacommunities.org.

This certificate and other data about the building may be shared with other bodies (including government departments and enforcement agencies) for research, statistical and enforcement purposes. Any personal data it contains will be processed in accordance with the General Data Protection Regulation and all applicable laws and regulations relating to the processing of personal data and privacy. For further information about this and how data about the property are used, please visit www.epcregister.com. To opt out of having information about your building made publicly available, please visit www.epcregister.com/optout.

Assessor's accreditation number:	QUID205001
Assessor's name:	Elliott Warwick
Phone number:	07916 127733
E-mail address:	elliottwarwick@dipdea.com
Related party disclosure:	No related party

There is more information in the guidance document *Energy Performance Certificates for the marketing, sale and let* of dwellings available on the Government website at:

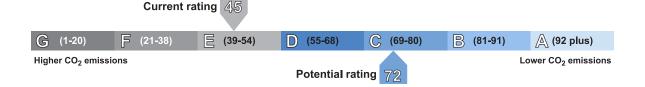
www.gov.uk/government/collections/energy-performance-certificates. It explains the content and use of this document, advises on how to identify the authenticity of a certificate and how to make a complaint.

About the impact of buildings on the environment

One of the biggest contributors to global warming is carbon dioxide. The energy we use for heating, lighting and power in homes produces over a quarter of the UK's carbon dioxide emissions.

The average household causes about 6 tonnes of carbon dioxide every year. Based on this assessment, your home currently produces approximately 11 tonnes of carbon dioxide every year. Adopting the recommendations in this report can reduce emissions and protect the environment. If you were to install these recommendations you could reduce this amount by 5.5 tonnes per year. You could reduce emissions even more by switching to renewable enerav sources.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions based on standardised assumptions about occupancy and energy use. The higher the rating the less impact it has on the environment.



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Appendix A5 General Notes.

A5 | General Notes

- A5.1 The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by Iceni Projects Ltd for inaccuracies in the data supplied by any other party.
- A5.2 The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.
- A5.3 No site visits have been carried out, unless otherwise specified.
- A5.4 This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in guidance may necessitate a re-interpretation of the report in whole or in part after its original submission.
- A5.5 The copyright in the written materials shall remain the property of Iceni Projects Ltd but with a royalty-free perpetual licence to the client deemed to be granted on payment in full to Iceni Projects Ltd by the client of outstanding amounts.
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5B PRINCE ARTHUR ROAD | HAMPSTEAD



Archaeology | Delivery | Design | Engagement | Heritage | Impact Management | Planning Sustainable Development | Townscape | Transport

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