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

SUSTAINABILITY AND ENERGY STATEMENT | MAY 2020

On behalf of Mr and Mrs Palsson



i | Table of Contents

1 EXECUTIVE SUMMARY	1
2 INTRODUCTION	
3 THE PROPOSALS	5
4 PLANNING AND REGULATORY CONTEXT	7
5 SUSTAINABILITY STATEMENT	
6 ENERGY STRATEGY	15
7 CONCLUSION	19
APPENDIX A1 SITE PLAN	
APPENDIX A2 WATER USAGE CALCULATOR	
APPENDIX A3 DER/TER WORKSHEETS	
APPENDIX A4 ENERGY PERFORMANCE CERTIFICATE	
APPENDIX A5 GENERAL NOTES	

5B PRINCE ARTHUR ROAD | HAMPSTEAD

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 three 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 1.7 whole is minimised.
- 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.

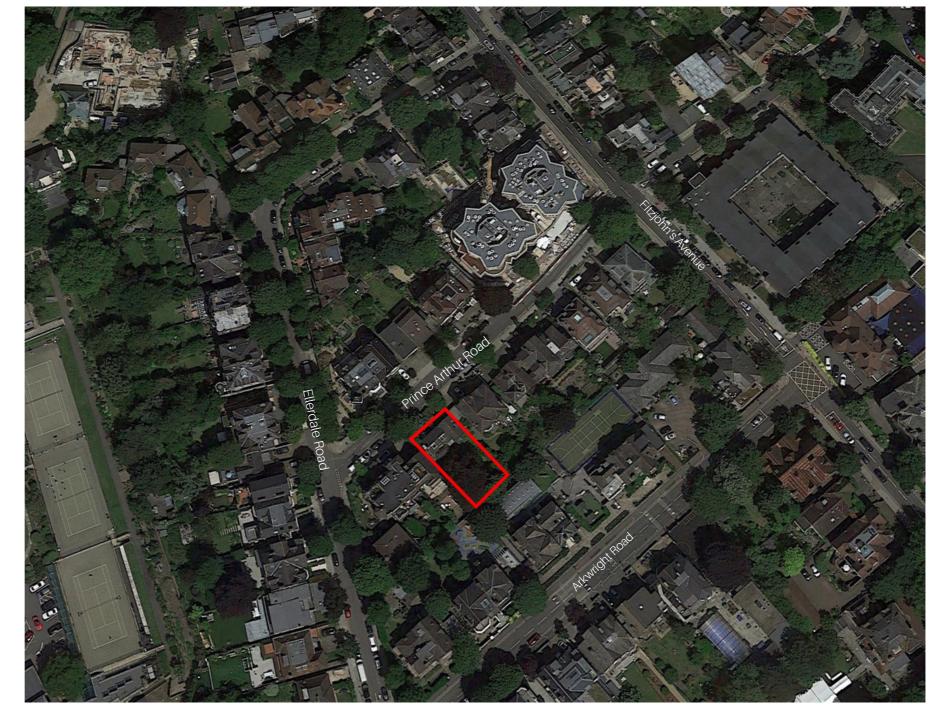
- 1.6 By designing to rigorous energy standards, and omitting the use of fossil fuels for space and water heating through the employment of an air source heat pump system, the application will respond directly to the Climate Emergency declared by the Council in April 2019. These measures combine to provide a carbon dioxide emissions saving of 27.9%, 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.

5B PRINCE ARTHUR ROAD | HAMPSTEAD

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.



5B PRINCE ARTHUR ROAD | HAMPSTEAD

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:
 - 1. 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 and the illustrative floor plans are displayed to the right. The proposed site layout is provided in Appendix A1.



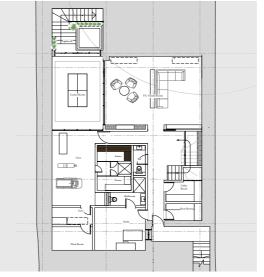


Figure 3.1 Proposed front elevations

Figure 3.3 Proposed basement



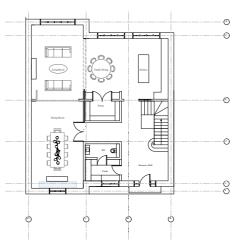


Figure 3.2 Proposed rear elevations

Figure 3.4 Proposed ground floor

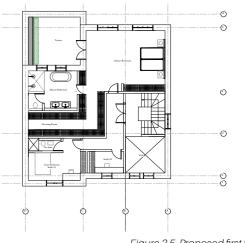


Figure 3.5 Proposed first floor

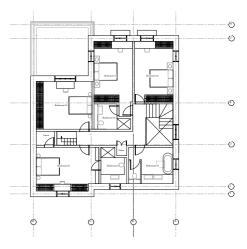


Figure 3.6 Proposed second floor

Section 4 **Planning and Regulatory Context.**



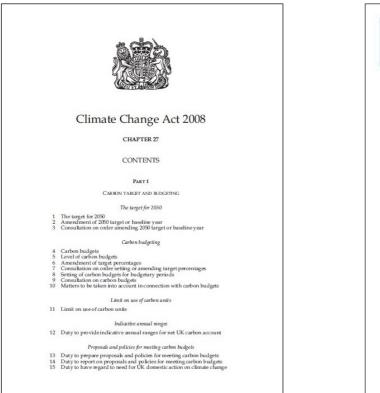
4 | Planning and Regulatory Context

4.1 Built environment sustainability is incorporated within 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 Act, the Fifth Annual Carbon Budget was accepted by the Government in June 2016. This sets out a budget for UK emissions for the period 2028-2032.
- 4.4 Following a commitment in June 2019, the Climate Change Act has been amended to target net zero emissions by 2050.



National Planning Policy Framework (February 2019)

- 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.
- 4.6 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 sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the 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 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 wellbeing.
- 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.

Futi

4.8

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

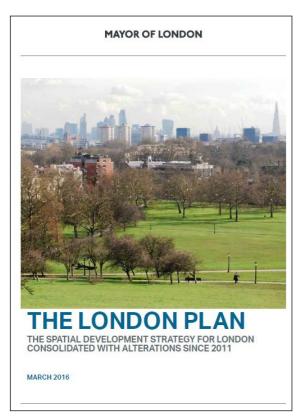
4 | Planning and Regulatory Context

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 is the overall strategic plan for London and includes 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:
 - 7. Be lean: use less energy
 - 8. Be clean: supply energy efficiently
 - 9. 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.

Sustainable Design and Construction Supplementary Planning Guidance (SPG) (April 2014)

4.11 This document provides 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 document contains 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.

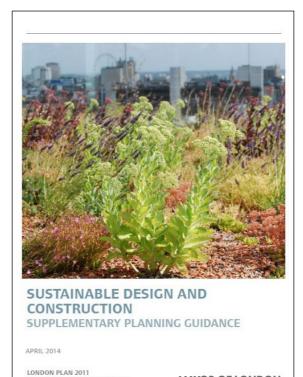
LOCAL

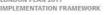
Camden Local Plan (2017)

- 4.12 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.
- 4.13 The overall vision of the Camden Plan, and the Local Plan, is as follows:

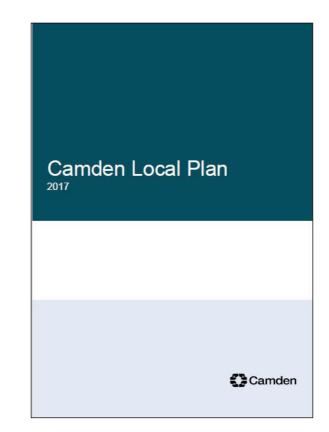
We want to make Camden a better borough - a place where everyone has a chance to succeed and nobody gets left behind. A place that works for everyone.

- 4.14 Policies of relevance to the proposed development include:
 - Policy D1 Design. This states that, in order to secure high quality design, the Council will require that development:





MAYOR OF LONDON



- · respects local context and character;
- is sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation;
- is of sustainable and durable construction and adaptable to different activities and land uses;
- comprises details and materials that are of high quality 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 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% CO₂ 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

green and blue roofs, and green walls where appropriate; and

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

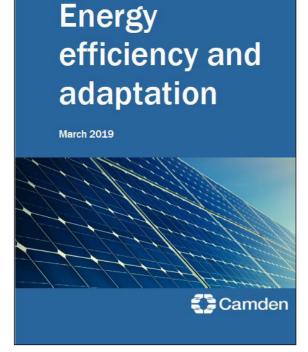
Camden Planning Guidance (CPG): Energy Efficiency and Adaptation (March 2019)

- 4.15 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: 4.16 C1 Health and well-being; A1 Open space; A2 Biodiversity; D1 Design; D2 Heritage; CC3 Water and flooding; CC4 Air quality; and, CC5 Waste.
- This CPG also outlines the requirements for producing 4.17 Energy Assessments and Sustainability Statements.

Camden Planning Guidance

Declaration of a Climate Emergency (April 2019)

4.18 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.



5B PRINCE ARTHUR ROAD | HAMPSTEAD



Section 5 Sustainability Statement.

5 | Sustainability Statement

- Although the proposed scheme is not referable 5.1 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.
- This Sustainability and Energy Statement for the 5.2 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

The site, as shown in Figure 5.1, is currently occupied 5.3 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

- The utilisation of this site will ensure that the proposed 5.4 dwelling is constructed on a previously used (brownfield) site, thus reducing development on greenfield and Green Belt sites.
- 5.5 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.

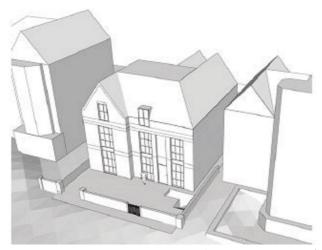
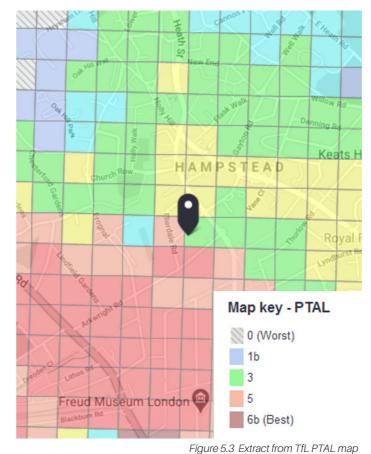


Figure 5.2 Massing model of the proposed dwelling (front)

Location and Transport

- The site is located towards the western end of Prince 5.6 5.10 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 5.11 5.7 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' 5.8 walk to the north, is served by the London Underground Northern line. To the south west, Finchley Road 5.12 and Frognal station, which is served by the London Overground line, is a 10-minute walk from the site.
- In addition to this, the site is located within walking 59 distance of two bus stops, served by the number 46 route between Lancaster Gate and the City of London.



Water Efficiency

- The city often consumes more water than is available during dry weather. As the population of London grows, this situation will be further exacerbated, with increased pressure on the supply of potable water.
- 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.
- 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 than 4.5 litres per place setting.

5.13 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 water.

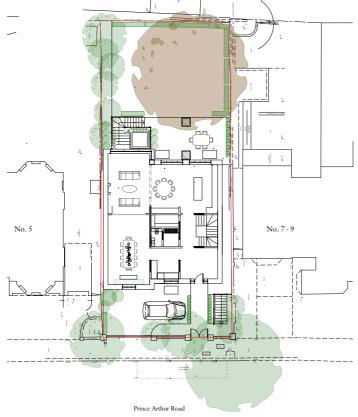
5 | Sustainability Statement

Materials and Waste

- 5.14 The selection of materials is determined by a variety 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 or B rated materials wherever possible.
- 5.15 During the detailed design of the building fabric, consideration will be given to minimising the environmental impact of materials, by selecting non-toxic and robust materials to ensure longevity and a minimal impact on the health of the occupants.
- 5.16 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 PEFC sources.
- 5.17 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.
- 5.18 Furthermore, applying the principles of a circular 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.
- 5.19 During operation, a dedicated storage area will be 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

- 5.20 The site in its current state comprises an existing 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.
- 5.21 An arboricultural survey has been undertaken and advice sought in relation to the existing trees, in particular the Copper Beech tree at the rear.
- 5.22 The proposals have been carefully considered around 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.
- 5.23 In addition to this, soft landscaping will be incorporated within the rear garden, as shown in Figure 5.4 below.



Tackling Increased Temperatures and Drought

- 5.24 Inorder to protect the development against overheating 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.
- 5.25 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

Figure 5.4 Proposed landscaping

all floors will provide a passive ventilation strategy 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 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

- 5.26 Figure 5.5 below confirms that the proposed site is located in Flood Zone 1, and is not at risk of flooding from rivers or the sea, reservoirs or surface water.
- 5.27 The proposed reduction in hardstanding area through the removal of the existing built structures in the rear garden, and the re-establishment of permeable ground around the roots of the Copper Beech tree, will aid in reducing the volume of surface water runoff on-site. Furthermore, the incorporation of soft landscaping will positively contribute to the management of the 5mm storm event, therefore limiting runoff for the typical everyday rainfall event.
- 5.28 The management of surface water in this way will reduce the burden on the existing Thames Water sewer network, as well as reducing the risk of flooding on-site and within the immediate surroundings.

Pollution

Air Pollution

- 5.29 The Environment Act 1995 requires all Local Authorities to review air quality within their districts. If it appears that any air quality 'Objective' prescribed in the regulations and in the National Air Quality Strategy is not likely to be achieved, then the Local Authority must designate the affected area as an Air Quality Management Area (AQMA).
- 5.30 The site location, and the whole of the London Borough of Camden, is specified as an AQMA, due to excessive levels of nitrogen dioxide (NO_2) and particulate matter (PM_{10}) arising from road transport.
- 5.31 Figure 5.6 below shows the levels of NO2 and PM10 measured at the site in 2016. These images indicate that the levels of NO_2 and PM_{10} present at the site in 2016 would have been below the annual mean objectives for both pollutants.

5.32 No fossil fuels will be used for the building systems 5.35 proposed for the new dwelling, and it is anticipated that transport emissions may be mitigated by encouraging the occupants to cycle through the provision of bicycle storage within the new dwelling.

Noise Pollution

- 5.33 The development is not located within close proximity to transport noise sources. The closest road noise sources are Rosslyn Hill (A502) to the east, and Finchley Road (A41) to the west of the site. However, the below map (top) shows that noise from these roads will have no impact on the new dwelling.
- 5.34 The site is also not located within close enough proximity to any rail lines for noise from this source to impact on the occupants in the future, as demonstrated on the map below (bottom).

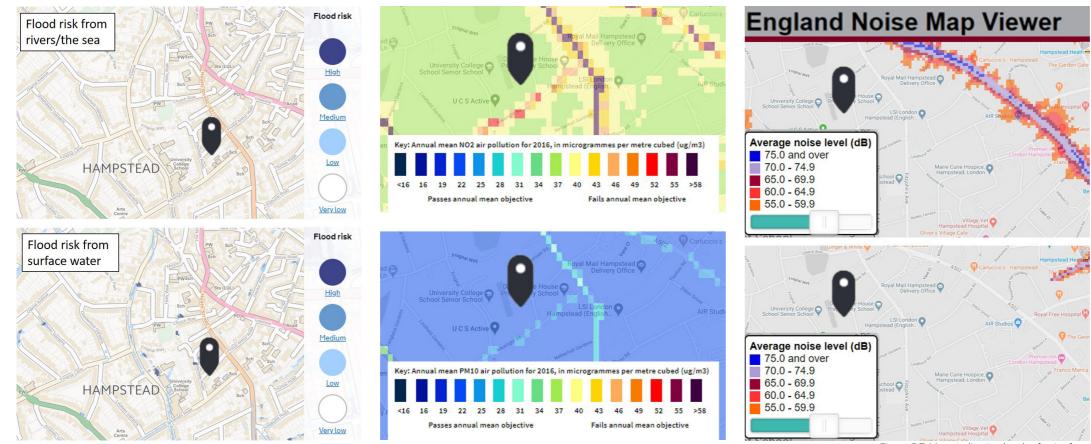


Figure 5.5 Extract from the Environment Agency's online flood map

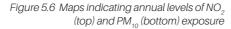


Figure 5.7 Maps indicating levels of noise from road (top) and rail (bottom) sources

5B PRINCE ARTHUR ROAD | HAMPSTEAD

In addition to this, the air source heat pump (ASHP) 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.

Section 6 Energy Strategy.

6 | Energy Strategy

The Energy Hierarchy

- 6.1 With reference to the policy requirements, guidance 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 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

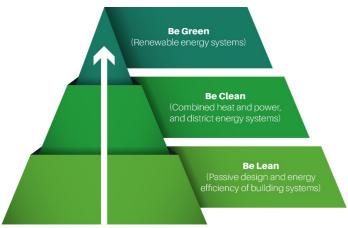


Figure 6.1 The Energy Hierarchy

6.4 Design recommendations were provided to Charlton Brown Architects, and preliminary design assessments were carried out to enable an energy strategy to develop from an early stage.

'Be Lean' | Use Less Energy

- 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 Authority (GLA) that new dwellings achieve at least 6.12 10% reduction via the 'Be Lean' stage.
- 6.7 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.

- 6.10 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

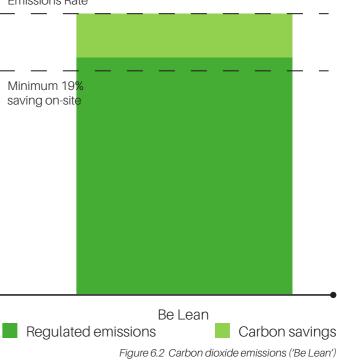
conductivity than the surrounding materials, creating a path of least resistance for heat transfer. Thermal bridges result in an overall reduction in thermal resistance of the building elements and should be designed out where possible to minimise unwanted heat loss. In order to minimise heat loss through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

- 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 ⁶ values were tested and improved in energy models to benchmark the resulting predicted CO₂ reduction.
 - Low energy LED lighting will be installed ^{6.14} 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

5B PRINCE ARTHUR ROAD | HAMPSTEAD

air will be provided via mechanical ventilation with heat recovery (MVHR), with a specific fan power (SFP) of 0.76 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).
 - 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.
 - The analysis presented below shows that the proposed dwelling will achieve a carbon dioxide emissions saving of 15.6% through energy efficiency means alone, under the 'Be Lean' scenario.



Part L:2013 Target Emissions Rate

6.15

(mnnr

12

10

8

6

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.

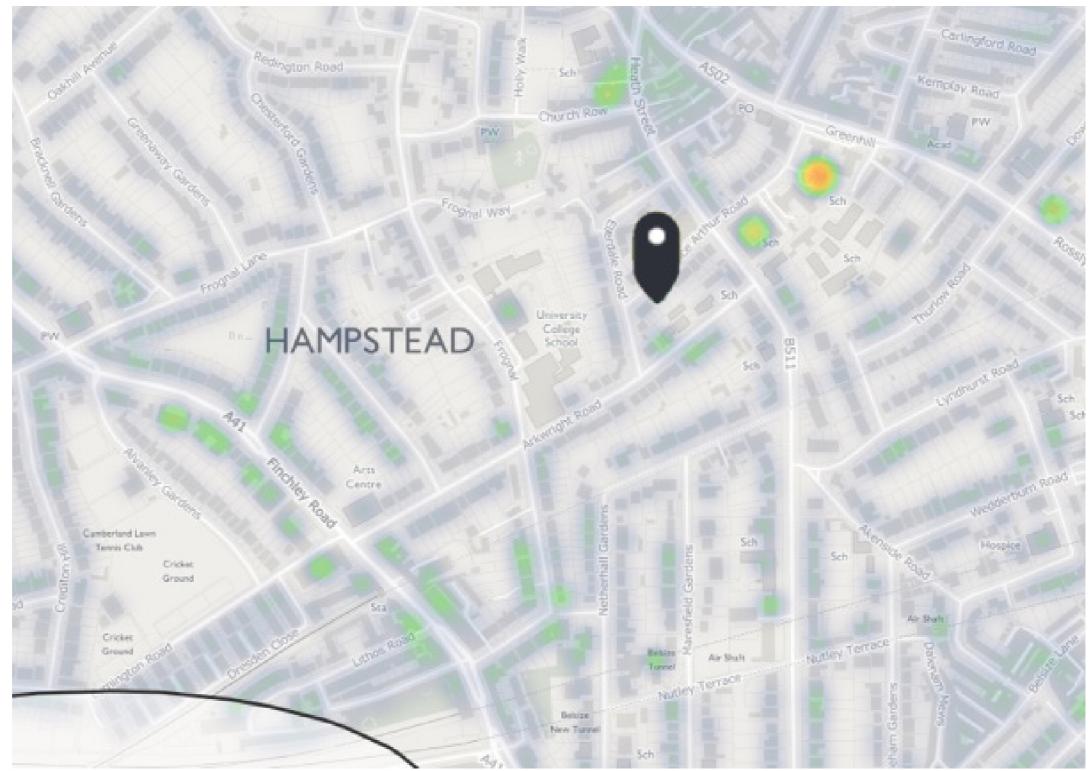


Figure 6.3 Extract from the London Heat Map

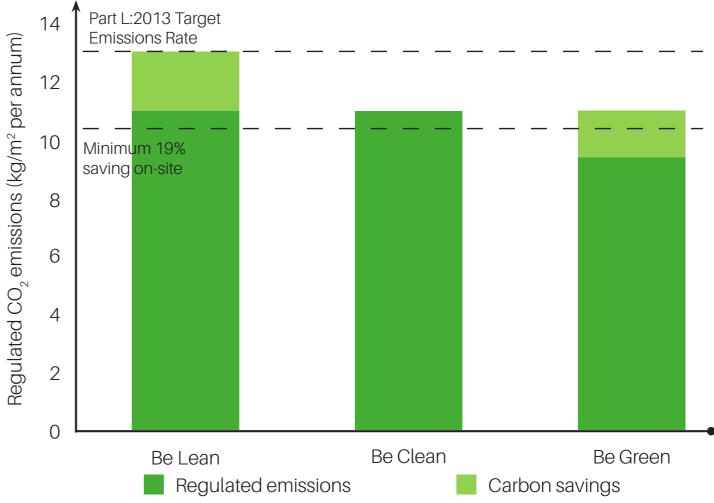
'Be Green' | Utilise Renewable Technologies

- 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.
- In determining the appropriate renewable technology 623 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 quiet 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. 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 of the roof to become overshadowed. This would 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 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 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.

- The Energy Performance Certificate (EPC) for the 6.26 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.
- 6.27 The energy analysis carried out shows that the proposed development achieves a carbon dioxide emissions saving of 27.9% through energy efficiency measures and renewable technologies. This exceeds the 19% target necessary to meet the requirements of the London Borough of Camden.



Ba L1 Em (kg) ar

5B PRINCE ARTHUR ROAD | HAMPSTEAD

TER: aseline Part A:2013 hissions ICO ₂ per nnum)	DER: Proposed 'Be Green' Emissions (kgCO ₂ per annum)	Emissions Savings (kgCO ₂ per annum)	Emissions Savings (%)
13.1	9.5	3.7	27.9%

Figure 6.4 Carbon dioxide emissions ('Be Green')

Sustainability and Energy Statement | 17

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.
- 7.2 Consideration has been given to the London Borough 7.5 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

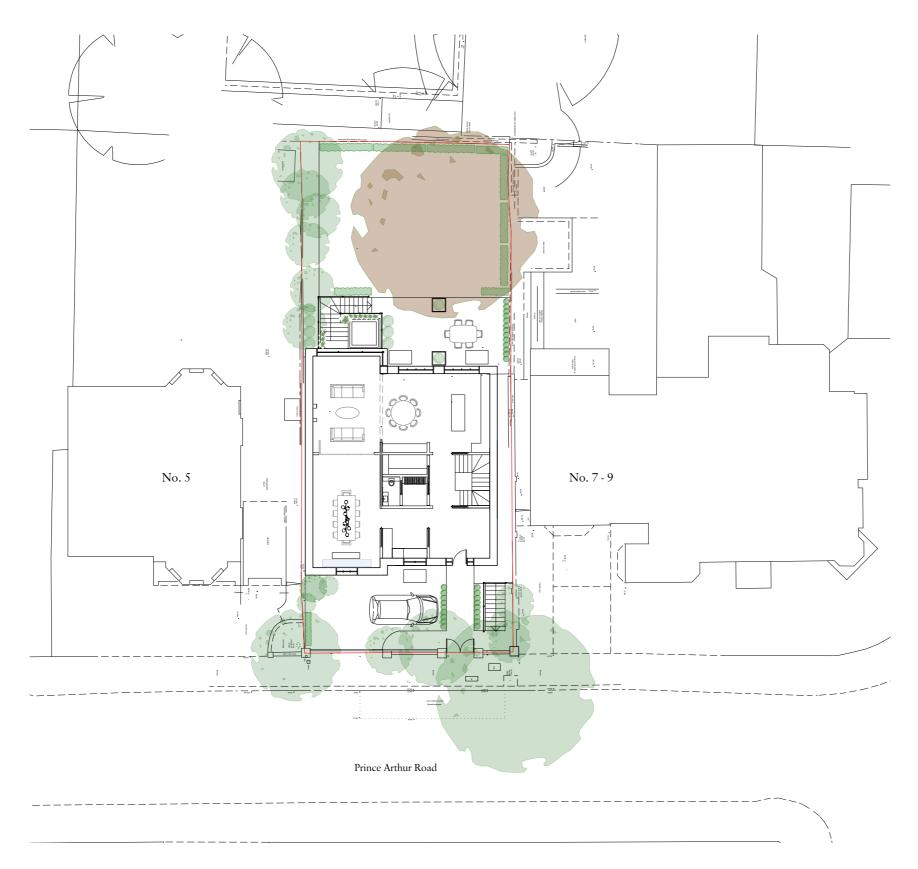
carbon dioxide emissions saving of 27.9%, compared to the Part L:2013 baseline, meeting and exceeding the requirements of the London Borough of Camden's policies to achieve a 19% reduction through on-site means alone.

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.

A1 | Site Layout



Rev Date

Telephone Email Website

Client Mr & Mrs Palsson Project Drawing Title Proposed Site Plan Date 02/04/2020 Scale 1:100 @A1 / 1:200 @ A3 Issue Status FOR PLANNING

5B PRINCE ARTHUR ROAD | HAMPSTEAD

Copyright - Charlton Brown Architects Ltd

Details

Charlton Brown Architecture & Interiors

The Belvedere, 2 Back Lane, Hampstead, London, NW3 1HL

+44(0)20 7794 1234 office@charltonbrown.com

Copper Beech House, 5b Prince Arthur Rd.

Drawn Checked SI CP

Appendix A2 Water Usage Calculator.

A2 | Water Usage Calculator

CSH Wat tool May 09

breglobal

Job no: Date: Assessor name Registration no: Development name

N/A 5B Prince Arthur Road

20-S011

03/04/2020

BRE Global 2010. BRE Certification is a registered trademark owned by BRE Global and may not be used without BRE Global's written permission.

Permission is given for this tool to be copied without infringement of copyright for use only on projects where a Code for Sustainable Homes assessment is carried out. Whilst every care is taken in preparing the Wat 1 assessment tool, BREG cannot accept responsibility for any inaccuracies or for consequential loss incurred as a result of such inaccuracies arising through the use of the Wat 1 tool.

PRINTING: before printing please make sure that in "Page Setup" you have selected the page to be as "Landscape" and that the Scale has been set up to 70% (maximum)

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)

House Type Type 1 Type 2 Type 3 Type 4 Type 5 Type 6 Type 7 Type 8 Type 9 Descriptio Typical Unit Litres Litres/ Litres/ Litres/ Litres/ Litres/ Litres/ Litres/ Litres Unit of Capacity/ apacity Capacity Capacity apacity apacity/ apacity apacity Capacity Installation Type person person person/ person person person person person/ perso measure flow rate low rate flow rate day day day day day day day day day Is a dual or single flush WC specified Dual Select option: Select option: Select option: Select option: Select option: Select option: **Click to Select** Click to Select Full flush volume 8.76 0.00 6 0.00 0.00 0.00 0.00 0.00 0.00 0.00 wc 3 8.88 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Part flush volume Taps Flow rate (litres (excluding kitchen 3 6.32 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 minute) and external taps) Are both a Bath & Shower Present Bath & Shower Select option: Capacity to 19.80 0.00 0.00 0.00 0.00 0.00 0.00 0.00 180 0.00 Bath verflow Flow rate (litres / 8 34.96 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Shower minute) Flow rate (litres / 4 12.12 0.00 Kitchen sink taps 0.00 0.00 0.00 0.00 0.00 0.00 0.00 minute) Select option: Has a washing machine been specified Yes Select option: 8.17 17.16 Washing Machine Litres / kg 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Has a dishwasher been specified Yes Select option: Litres / place 1.25 4.50 0.00 Dishwasher 0.00 0.00 0.00 0.00 0.00 0.00 0.00 etting Has a waste disposal unit be Select Select Select Select Select Select Select Select 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 No specified optior option option option option option option option: Litres / person / Water Softener 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Calculated Use 112.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 Normalisation facto 0.0 0.0 Total Consumption 102.4 0.0 0.0 0.0 0.0 0.0 0.0 Code for Level Sustainable Homes Mandatory level -3/4 External use 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 Building 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 **Total Consumption** 107.4 Regulations 17.K 17.K Compliance? Yes

5B PRINCE ARTHUR ROAD | HAMPSTEAD

	Тур	e 10
s/ n/	Capacity/ flow rate	Litres/ person/ day
t	Click to	Select
)		0.00
)		0.00
)		0.00
	Select	option:
)		0.00
)		0.00
)		0.00
	Select	option:
)		0.00
	Select	option:
)		0.00
)	Select option:	0.00
)		0.00
		0.0
		0.91
		0.0
		-
		5.0
		0.0
		-

Appendix A3 DER/TER Worksheets.

A3 | DER/TER Worksheets

DER WorkSheet: New dwelling design stage

Assessor Name: Software Name:	Stroma FSAP 2	012	•	a Nun are Ve	nber: ersion:	Vers	ion: 1.0.4.25	
		Prop	perty Address	: 5B Pri	ince Arthur	Road_Be Lea	an	
Address :								
1. Overall dwelling dime	ensions:							
Basement			Area(m ²)	1	Av. Heig		Volume(m	<u></u>
			177.5	(1a) x	4	(2a) =	710	(3a
Ground floor			155	(1b) x	3.1	(2b) =	480.5	(3b
First floor			131.9	(1c) x	2.7	(2c) =	356.13	(3c
Second floor		i	131.9	(1d) x	2.6	(2d) =	342.94	(3d
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	596.3	(4)			L	
Dwelling volume		, , ,		(3a)+(3	b)+(3c)+(3d)+	(3e)+(3n) =	1889.57	(5)
•				() (-	-, (, (,	()	1009.37	(3)
2. Ventilation rate:	main	secondary	other		total		m ³ per ho	ur
Number of chimnevs	heating	heating	+		0	x 40 =	0	 (6a
,		0						
Number of open flues	0 *	0	• 0] = [0	x 20 =	0	(6b
Number of intermittent fa	ans				0	x 10 =	0	(7a
Number of passive vents	5				0	x 10 =	0	(7b
Number of flueless gas f	ires			- \ i	0	x 40 =	0	(7c
						Air o	hanges per h	nour
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7a)+	+(7b)+(7c) =		0	+ (5) =	0	(8)
If a pressurisation test has	been carried out or is inter	nded, proceed to	(17), otherwise	continue	from (9) to (16	5)		
Number of storeys in t	he dwelling (ns)						0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10
Structural infiltration: ().25 for steel or timbe resent, use the value con				truction		0	(11
deducting areas of open		coponang to an	greater wan ar	a faiter				
If suspended wooden	floor, enter 0.2 (unse	ealed) or 0.1 ((sealed), else	enter 0)		0	(12
If no draught lobby, er							0	(13
Percentage of window	s and doors draught	stripped					0	(14
Window infiltration			0.25 - [0.				0	(15
Infiltration rate					(12) + (13) + (0	(16
Air permeability value,					netre of en	velope area	3	(17
f based on air permeabi Air permeability value appli					v is heina use	4	0.15	(18
Number of sides shelter			sogree all pe		,	-	2	(19
Shelter factor			(20) = 1 -	[0.075 x	(19)] =		0.85	(20
nfiltration rate incorpora	ting shelter factor		(21) = (18	3) x (20) =			0.13	(21
nfiltration rate modified	for monthly wind spe	ed						_
Jan Feb	Mar Apr Ma	v Jun	Jul Aua	Sep	Oct	Nov Dec		

DER WorkSheet: New dwelling design stage

Monthly averag	e wind s	speed fr	om Tabl	e 7									
(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22) = ((22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
												1	
Adjusted infiltra		·	<u> </u>				<u> </u>	<u> </u>					
0.16 Calculate effect	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
If mechanical				ne appli		30						0.5	(23a)
If exhaust air hea	at pump u	ising App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23b)
If balanced with I	heat reco	very: effic	iency in %	allowing f	for in-use f	actor (from	n Table 4h) =				73.1	(23c)
a) If balanced	l mecha	inical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)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		(24a)
b) If balanced	l mecha	nical ve	entilation	without	heat red	covery (I	MV) (24b	o)m = (2	2b)m + (i	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	use ext	ract ver	tilation of	or positiv	/e input	ventilatio	on from o	outside					
if (22b)m	< 0.5 ×	(23b), t	hen (24	c) = (23b	o); othen	vise (24	c) = (22b	b) m + 0	.5 × (23t)	_		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.51				
(24d)m= 0	0	0	0	0		40)11 -	0.5 + [[2	20,111 X	0.5	0	0		(24d
Effective air c		rate - er	- ter (24 a) or (24)		c) or (2/	d) in hor		-				
(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. Heat losses													
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/	<)	k-value kJ/m ² ·l		A X k kJ/K
Doors		. ,			5.7	×	1	=	5.7	ŕ			(26)
Windows Type	1				20.3	− ×1	/[1/(1.3)+	0.04] =	25.09	=			(27)
Windows Type:	2				53.4	≓ ×1	/[1/(1.3)+	0.04] =	65.99	=			(27)
Rooflights Type	1				0.8	Ξ,	/[1/(1.3) +	0.04] =	1.04	=			(27b)
Rooflights Type					1.3	≓ ,	/[1/(1.3) +	0.041 =	1.69	=			(27b
Floor					177.5	=	0.1	_	17.75	= ,			(28)
Walls Type1	295		79.4	_	216	4∶	0.15		32.4	=		4 12	(29)
Walls Type2	1295.0	<u> </u>			-	= "		=]		=		╡╞	(29)
Walls Type2 Walls Type3		_	0	=	129.2	≝ "	0.14	= 1	18.03	╡╏		\dashv	
	226.4	_	0	_	226.4	-	0.15		33.96	\dashv		╡┝	(29)
Roof Type1	136.		2.1		134	_ *	0.13		17.42	4			(30)
Roof Type2	18.9		0		18.9	×	0.13	=	2.46				(30)
Total area of ele					983.5								(31)
* for windows and n ** include the areas						ated using	formula 1	/[(1/U-valu	ue)+0.04] a	s given in	paragraph	3.2	
Fabric heat loss				2 2 pur			(26)(30)) + (32) =				221.3	9 (33)
	,		- /										

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

DER WorkSheet: New dwelling design stage



Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 1 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 2 of 9

If commun Volume fa Temperatu Energy los Enter (50 Water sto (56)m= 3 If cylinder or (57)m= 32 Primary ci Primary ci (modifie (59)m= 2 Combi los (61)m=
 (61)m=

 Total hea

 (62)m=
 24

 Solar DHW

 (add addii

 (63)m=

 Output fro

 (64)m=
 24
 Heat gain (65)m= 10 include 5. Intern Metabolic (66)m= 17 Lighting g Appliance (68)m= 66 Cooking g

Page 3 of 9

5B PRINCE ARTHUR ROAD | HAMPSTEAD

DER WorkSheet: New dwelling design stage

Hot water stor				e 2 (kW	h/litre/da	iy)					0		(51
If community I			on 4.3										
Volume factor										-	0		(52)
Temperature f	actor from	m Table	2b								0		(53)
Energy lost fro			, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54
Enter (50) or	(54) in (5	i5)								1.	05		(55)
Nater storage	loss cald	culated f	or each	month			((56)m = (55) × (41)	n				
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		(56
f cylinder contain	s dedicated	d solar stor	rage, (57)r	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		(57
Primarv circuit	t loss (an	inual) fro	m Table	3							0		(58
Primary circuit	`				59)m = ((58) ÷ 36	5 × (41)	m		L			
(modified 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		(59
Combi loss ca	i hateluul	for each	month (61)m =	(60) ± 36	35 x (41))m						
61)m= 0		0	0	0 1)11 -	00) • 0	0	0	0	0	0	0		(61
	-			-		-		-	-	-		(===) (==	
Fotal heat req			<u> </u>				<u>, </u>			<u> </u>	È /	(59)m + (61	·
62)m= 247.96	218.46	229.24	205.22	200.9	179.22	171.85	188.95	188.74	212.81	225.38	241.9		(62
iolar DHW input									r contribut	ion to wate	er heating)		
add additiona	I lines if I	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (S)					
63)m= 0	0	0	0	0	0	0	Ò	0	0	0	0		(63
Dutput from w	ater heat	ter		-									
54)m= 247.96	218.46	229.24	205.22	200.9	179.22	171.85	188.95	188.74	212.81	225.38	241.9		
							Outp	out from wa	ater heate	r (annual),		2510.62	(64
leat gains fro	m water	heating	kWh/m	onth 0.2	5 10 85	x (45)m	+ (61)m	1+08	r [(46)m	+ (57)m	+ (59)m	1	
65)m= 108.58	96.25	102.36	93.53	92.94	84.88	83.28	88.96	-	96.9	· · /	<u>, ,</u>		
								88.05			106 57		(65
include (57)	m in colo	ulation a	£ (CE)-	anh if a				88.05		100.23	106.57		(65
	m in calc		• •									eating	(65
5. Internal g			• •									eating	(65
	ains (see ns (Table	Table 5 5), Wat	and 5a):		s in the o			ater is fi	rom com		leating	(65
	ains (see	Table 5	and 5a									eating	(65
Metabolic gair Jan	ains (see ns (Table	Table 5 5), Wat	and 5a):	ylinder i	s in the o	dwelling	or hot w	ater is fi	rom com	munity h	leating	
Metabolic gair Jan 66)m= 175.86	ains (see ns (Table Feb 175.86	Table 5 5), Wat Mar 175.86	and 5a ts Apr 175.86	May 175.86	ylinder i Jun 175.86	Jul	Aug 175.86	or hot w Sep 175.86	ater is fi Oct	rom com	munity h	leating	
Metabolic gair Jan 66)m= 175.86 Lighting gains	ains (see ns (Table Feb 175.86	Table 5 5), Wat Mar 175.86	and 5a ts Apr 175.86	May 175.86	ylinder i Jun 175.86	Jul	Aug 175.86	or hot w Sep 175.86	ater is fi Oct	rom com	munity h	eating	(65
Metabolic gair Jan 66)m= 175.86 Lighting gains 67)m= 65.29	ains (see ns (Table Feb 175.86 (calculat 57.99	5), Watt Mar 175.86 ted in Ap 47.16	Apr 175.86 ppendix 1 35.7	May 175.86 , equat 26.69	Jun 175.86 ion L9 o 22.53	Jul 175.86 r L9a), a 24.35	Aug 175.86 Iso see 31.65	or hot w Sep 175.86 Table 5 42.48	Oct 175.86 53.93	Nov	Dec	leating	(66
Metabolic gair Jan (66)m= 175.86 Lighting gains (67)m= 65.29 Appliances ga	ains (see ns (Table Feb 175.86 (calculat 57.99 iins (calcu	5), Watt Mar 175.86 ted in Ap 47.16 ulated in	and 5a ts Apr 175.86 opendix 1 35.7 Append): 175.86 L, equat 26.69 dix L, eq	Jun 175.86 ion L9 o 22.53 uation L	Jul 175.86 r L9a), a 24.35 13 or L1	Aug 175.86 Iso see 31.65 3a), also	or hot w Sep 175.86 Table 5 42.48 o see Tal	Oct 175.86 53.93 ble 5	Nov 175.86 62.95	Dec 175.86 67.1	leating	(66
Jan 66)m= Jan ighting gains 175.86 ighting gains 67.78 67)m= 65.29 Appliances ga 669.12	ains (see Feb 175.86 (calculat 57.99 iins (calcu	5), Watt Mar 175.86 ted in Ap 47.16 ulated in 658.56	and 5a ts Apr 175.86 opendix 1 35.7 Append 621.31	May 175.86 L, equat 26.69 dix L, eq 574.29	ylinder i Jun 175.86 ion L9 o 22.53 uation L 530.1	Jul 175.86 r L9a), a 24.35 13 or L1 500.58	Aug 175.86 Iso see 31.65 3a), also 493.64	or hot w Sep 175.86 Table 5 42.48 see Tal 511.13	Oct 175.86 53.93 ble 5 548.38	Nov	Dec		(66
Aetabolic gair Jan Jan 175.86 ighting gains 67)m= 65.29 Appliances ga 68)m= 669.12 Cooking gains	ains (see ns (Table Feb 175.86 (calculat 57.99 iins (calculat 676.06 6 (calculat	Table 5 5), Watt Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap	Apr Apr 175.86 ppendix l 35.7 Append 621.31 ppendix	May 175.86 L, equat 26.69 dix L, eq 574.29 L, equal	Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a)	Aug 175.86 Iso see 31.65 3a), also 493.64), also se	Sep 175.86 Table 5 42.48 see Tal 511.13 se Table	Oct 175.86 53.93 ble 5 548.38 5	Nov 175.86 62.95 595.4	Dec 175.86 67.1 639.59		(66 (67 (68
Aetabolic gain Jan 56)m= 175.86 ighting gains 57)m= 65.29 oppliances ga 88)m= 669.12 Cooking gains 59)m= 40.59	ains (see ns (Table Feb 175.86 (calculat 57.99 ins (calculat 676.06 s (calculat 40.59	Table 5 5), Watt Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59	and 5a ts Apr 175.86 opendix l 35.7 Append 621.31 opendix 40.59	May 175.86 L, equat 26.69 dix L, eq 574.29	ylinder i Jun 175.86 ion L9 o 22.53 uation L 530.1	Jul 175.86 r L9a), a 24.35 13 or L1 500.58	Aug 175.86 Iso see 31.65 3a), also 493.64	or hot w Sep 175.86 Table 5 42.48 see Tal 511.13	Oct 175.86 53.93 ble 5 548.38	Nov 175.86 62.95	Dec 175.86 67.1	leating	(66 (67 (68
Metabolic gains Jan 66)m= 175.86 .ighting gains 67)m= 65.29 Appliances ga 68)m= 669.12 Cooking gains 69)m= 40.59 Pumps and fa	ains (see ns (Table Feb 175.86 (calculat 57.99 ins (calculat 676.06 s (calculat 40.59 ns gains	Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59 (Table 5	Apr 175.86 ppendix 1 35.7 Append 621.31 ppendix 40.59 ja)): May 175.86 L, equat 26.69 dix L, eq 574.29 L, equat 40.59	Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Aug 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	Sep 175.86 Table 5 42.48 see Tal 511.13 se Table	Oct 175.86 53.93 ble 5 548.38 5	Nov 175.86 62.95 595.4 40.59	Dec 175.86 67.1 639.59	leating	(66 (67 (68
Metabolic gains [34] Jan [46]m= 175.86 [35] Jan [45] Jan [45] Jan [45] Jan [45] Jan [46] Jan [45] Jan [40] Jan [4	ains (see ns (Table Feb 175.86 (calculat 57.99 ins (calculat 676.06 s (calculat 40.59	Table 5 5), Watt Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59	and 5a ts Apr 175.86 opendix l 35.7 Append 621.31 opendix 40.59	May 175.86 L, equat 26.69 dix L, eq 574.29 L, equal	Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a)	Aug 175.86 Iso see 31.65 3a), also 493.64), also se	Sep 175.86 Table 5 42.48 see Tal 511.13 se Table	Oct 175.86 53.93 ble 5 548.38 5	Nov 175.86 62.95 595.4	Dec 175.86 67.1 639.59	eating	(66 (67 (68
Metabolic quin Jan 66)m= 175.86 Lighting gains 67)m= 67)m= 65.29 Appliances ga 68)m= 68)m= 669.12 Cooking gains 69/m= 40.59 Pumps and fa 70)m= 3	ains (see ns (Table Feb 175.86 (calculat 57.99 iins (calculat 676.06 s (calculat 40.59 ns gains 3	Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59 (Table 5 3	and 5a ts Apr 175.86 ppendix 35.7 Appendix 621.31 opendix 40.59 isa) 3): May 175.86 L, equat 26.69 dix L, eq 574.29 L, equal 40.59 3	Jun 175.86 ion L9 o 22.53 uation L 530.1 tion L15 40.59 3	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Aug 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	Sep 175.86 Table 5 42.48 5 see Tal 511.13 se Table 40.59	Oct 175.86 53.93 ble 5 548.38 5 40.59	Nov 175.86 62.95 595.4 40.59	Dec 175.86 67.1 639.59 40.59	eating	(66 (67 (68
(66)m= 175.86 Lighting gains 65.29 Appliances ga 669.12 Cooking gains 669.29 Lighting gains 669.12 Cooking gains 40.59 Pumps and fa 10.59	ains (see ns (Table Feb 175.86 (calculat 57.99 iins (calculat 676.06 s (calculat 40.59 ns gains 3	Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59 (Table 5 3	and 5a ts Apr 175.86 ppendix 35.7 Appendix 621.31 opendix 40.59 isa) 3): May 175.86 L, equat 26.69 dix L, eq 574.29 L, equal 40.59 3	Jun 175.86 ion L9 o 22.53 uation L 530.1 tion L15 40.59 3	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Aug 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	Sep 175.86 Table 5 42.48 5 see Tal 511.13 se Table 40.59	Oct 175.86 53.93 ble 5 548.38 5 40.59	Nov 175.86 62.95 595.4 40.59	Dec 175.86 67.1 639.59 40.59	leating	(66 (67 (68 (69 (70
Metabolic gains 66)m= Jan 66)m= 175.86 Lighting gains 65.29 Appliances ga 669/m= 66)m= 669.12 Cooking gains 669/m= 60)m= 40.59 Pumps and fa 70)m= 3 cosses e.g. ev 71)m= -140.68	ains (see ns (Table Feb 175.86 (calculat 57.99 ins (calculat 676.06 6 (calcula 40.59 ns gains 3 vaporatio -140.68	Table 5 5), Watt Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59 (Table 5 3 n (negat -140.68	and 5a ts Apr 175.86 ppendix l 35.7 Appendix 621.31 opendix 40.59 5a) 3 tive valu	May 175.86 L, equat 26.69 dix L, eq 574.29 L, equat 40.59 3 es) (Tab	Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59 3 le 5)	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59 3	Aug 175.86 Iso see 31.65 3a), also 493.64), also se 40.59 3	Sep 175.86 Table 5 42.48 See Tal 511.13 see Table 40.59 3	Oct 175.86 53.93 ble 5 548.38 5 40.59 3	Nov 175.86 62.95 595.4 40.59 3	Dec 175.86 67.1 639.59 40.59 3		(66
Metabolic quin Jan 66)m= Jan 175.86 Jan Lighting gains 65.29 Appliances ga 669.12 Cooking gains 69.12 Cooking gains 40.59 Pumps and fa 70m= 3 cosses e.g. etc.	ains (see ns (Table Feb 175.86 (calculat 57.99 ins (calculat 676.06 6 (calcula 40.59 ns gains 3 vaporatio -140.68	Table 5 5), Watt Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in Ap 40.59 (Table 5 3 n (negat -140.68	and 5a ts Apr 175.86 ppendix l 35.7 Appendix 621.31 opendix 40.59 5a) 3 tive valu	May 175.86 L, equat 26.69 dix L, eq 574.29 L, equat 40.59 3 es) (Tab	Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59 3 le 5)	Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59 3	Aug 175.86 Iso see 31.65 3a), also 493.64), also se 40.59 3	Sep 175.86 Table 5 42.48 See Tal 511.13 see Table 40.59 3	Oct 175.86 53.93 ble 5 548.38 5 40.59 3	Nov 175.86 62.95 595.4 40.59 3	Dec 175.86 67.1 639.59 40.59 3		(66 (67 (68 (69 (70

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 4 of 9

A3 | DER/TER Worksheets

DER WorkSheet: New dwelling design stage

DER WorkSheet: New dwelling design stage

DER WorkSheet: New dwelling design stage

Fotal interna						<u> </u>	3)m + (69)m + (70	·			1	
73)m= 959.11		2.06	865.67 804.6	5 7	49.29 715.61	723	.61 754.65	811.3	876.31 92	8.69		(73)
Solar gair												
-			flux from Table 6 Area	a and	Flux	tions		applic	FF		Gains	
Unentation:	Access Fact Table 6d	Dr	Area m ²		Table 6a		9_ Table 6b		Table 6c		(W)	
Southeast 0.9x	0.77	٦ ×	53.4	l x	36.79	x	0.63	1 × 1	0.7	1 =	600.47	7(77)
Southeast 0.9x	0.77	i .	53.4	x	62.67	×	0.63	×	0.7	1 =	1022.81	
Southeast 0.9x	0.77	i .	53.4	x	85.75	×	0.63	x	0.7	i =	1399.46	707
Southeast 0.9x	0.77	×	53.4	x	106.25	x	0.63	×	0.7	i =	1734	707
Southeast 0.9x	0.77	×	53.4	x	119.01	×	0.63	×	0.7	1 =	1942.22	[77]
Southeast 0.9x	0.77	×	53.4	×	118.15	x	0.63	×	0.7	i =	1928.18	(77)
Southeast 0.9x	0.77	×	53.4	x	113.91	x	0.63	×	0.7	i =	1858.97	- (77)
Southeast 0.9x	0.77	×	53.4	x	104.39	x	0.63	×	0.7	i =	1703.62	777
Southeast 0.9x	0.77	×	53.4	×	92.85	x	0.63	×	0.7] =	1515.32	(77)
Southeast 0.9x	0.77	×	53.4	×	69.27	x	0.63	×	0.7] =	1130.43	(77)
Southeast 0.9x	0.77	×	53.4	×	44.07	x	0.63	x	0.7	-	719.22	(77)
Southeast 0.9x	0.77	×	53.4	x	31.49	x	0.63	×	0.7] =	513.87	(77
Southwest <mark>0.9x</mark>	0.77	×	20.3	x	36.79		0.63	×	0.7] =	228.27	(79
Southwest <mark>0.9x</mark>	0.77	×	20.3	x	62.67	/	0.63	×	0.7	=	388.82	(79
Southwest <mark>0.9x</mark>	0.77	x	20.3	×	85.75		0.63	×	0.7	=	532	(79
Southwest <mark>0.9x</mark>	0.77	×	20.3	x	106.25		0.63	×	0.7	=	659.18	(79
Southwest0.9x	0.77	×	20.3	×	119.01		0.63	×	0.7	=	738.34	(79)
Southwest <mark>0.9x</mark>	0.77	×	20.3	×	118.15		0.63	×	0.7	=	733	(79)
Southwest _{0.9x}	0.77	x	20.3	x	113.91		0.63	×	0.7	=	706.69	(79
Southwest _{0.9x}	0.77	x	20.3	x	104.39		0.63	×	0.7	=	647.63	(79
Southwest _{0.9x}	0.77	x	20.3	x	92.85		0.63	×	0.7	=	576.05	(79
Southwest _{0.9x}	0.77	x	20.3	x	69.27		0.63	×	0.7] =	429.73	(79
Southwest _{0.9x}	0.77	×	20.3	×	44.07		0.63	×	0.7] =	273.41	(79)
Southwest _{0.9x}	0.77	×	20.3	×	31.49		0.63	×	0.7] =	195.35	(79)
Rooflights 0.9x	1	×	0.8	×	26	×	0.3	×	0.7] =	3.93	(82)
Rooflights 0.9x	1	×	1.3	×	37.03	×	0.3	×	0.7] =	9.1	(82)
Rooflights 0.9x	1	×	0.8	×	54	×	0.3	×	0.7] =	8.16	(82)
Rooflights 0.9x	1	×	1.3	×	70.28	×	0.3	×	0.7] =	17.27	(82)
Rooflights 0.9x	1	×	0.8	×	96	×	0.3	×	0.7	=	14.52	(82)
Rooflights 0.9x	1	×	1.3	×	111.87	×	0.3	×	0.7	=	27.49	(82)
Rooflights 0.9x	1	×	0.8	×	150	×	0.3	×	0.7	=	22.68	(82)
Rooflights 0.9x	1	×	1.3	×	159.33	×	0.3	×	0.7	=	39.15	(82)
Rooflights 0.9x	1	×	0.8	×	192	×	0.3	×	0.7	=	29.03	(82)
Rooflights 0.9x	1	×	1.3	x	193.3	x	0.3	×	0.7	=	47.49	(82)

Page 5 of 9

Rooflights 0.9x	1	x	0.8	×	200	x	0.3	x	0.7	=	30.24	(82)
Rooflights 0.9x	1	x	1.3	x	197.35	x	0.3	x	0.7	=	48.49	(82)
Rooflights 0.9x	1	×	0.8	×	189	x	0.3	x	0.7	=	28.58	(82)
Rooflights 0.9x	1	x	1.3	×	188.08	x	0.3	x	0.7	=	46.21	(82)
Rooflights 0.9x	1	x	0.8	x	157	x	0.3	x	0.7	=	23.74	(82)
Rooflights 0.9x	1	x	1.3	x	162.62	x	0.3	x	0.7	=	39.95	(82)
Rooflights 0.9x	1	x	0.8	x	115	x	0.3	x	0.7	=	17.39	(82)
Rooflights 0.9x	1	x	1.3	x	128.66	x	0.3	x	0.7	=	31.61	(82)
Rooflights 0.9x	1	×	0.8	x	66	x	0.3	x	0.7	=	9.98	(82)
Rooflights 0.9x	1	×	1.3	x	82.24	x	0.3	x	0.7	=	20.21	(82)
Rooflights 0.9x	1	×	0.8	x	33	x	0.3	x	0.7	=	4.99	(82)
Rooflights 0.9x	1	×	1.3	x	45.75	x	0.3	x	0.7	=	11.24	(82)
Rooflights 0.9x	1	×	0.8	x	21	x	0.3	x	0.7	=	3.18	(82)
Rooflights 0.9x	1	x	1.3	×	30.74	x	0.3	x	0.7	=	7.55	(82)

Solar g	ains in	watts, ca	lculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
83)m=	841.76	1437.07	1973.47	2455	2757.08	2739.9	2640.44	2414.95	2140.37	1590.35	1008.86	719.95	i i	(83)
rotal g	ains – i	nternal a	nd solar	(84)m =	(73)m ·	+ (83)m	, watts							
84)m=	1800.87	2393.1	2895.52	3320.68	3561.74	3489.19	3356.05	3138.56	2895.02	2401.65	1885.17	1648.64		(84)
7 Me	an inter	nal temp	erature	(heat ing	season)								
							from Tab	le 9 Th	1 (°C)				21	(85
					a, h1,m	-		,						
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aua	Sep	Oct	Nov	Dec	1	
86)m=	1	1 00	1	0.99	0.93	0.76	0.56	0.62	0.89	1	1	1		(86
	_	· ·			· · ·	_	ps 3 to 7	_	<u> </u>				,	
87)m=	20.02	20.17	20.38	20.65	20.87	20.98	21	21	20.93	20.63	20.27	20	1	(87
Temp	erature	during h	eating p	eriods i	n rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
38)m=	20.28	20.29	20.29	20.3	20.31	20.32	20.32	20.33	20.32	20.31	20.3	20.3	i i	(88
, L Itilisa	tion fac	tor for a	ains for i	rest of d	welling	h2 m (se	e Table	9a)						
89)m=	1	1	1	0.98	0.9	0.69	0.48	0.53	0.85	0.99	1	1	1	(89
													1	
		<u> </u>				<u> </u>		<u> </u>	7 in Tabl	<u> </u>			1	
90)m=	18.92	19.15	19.46	19.86	20.17	20.31	20.32	20.32	20.26	19.84	19.31	18.91		(90
										fLA = Livin	g area + (4)=	0.13	(91
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
92)m=	19.06	19.27	19.57	19.96	20.25	20.39	20.41	20.41	20.34	19.94	19.43	19.05	1	(92
Apply	adjustn	nent to th	ne mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
93)m=	18.91	19.12	19.42	19.81	20.1	20.24	20.26	20.26	20.19	19.79	19.28	18.9	i i	(93
8. Spa	ace hea	ting requ	irement				-							
						ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-cald	culate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
		4 m x 6 m x	aina has	-										
Utilisa	ation fac	tor for ga	ains, nin										1	

Page 6 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

	1800.74	2391.77	2885.53	3248.02	3187.45	2373.68	1569.02	1644.42	2422.05	2379.25	1884.56	1648.58	1	
Mont	hly aver	age exte	rnal tem	perature	e from Ta	able 8							1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2]	
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm,W:	=[(39)m	x [(93)m	– (96)m]			,	
(97)m=	6659.58	6455.79	5840.04	4821.4	3697.21	2425.97	1572.03	1650.98	2642.66	4041.29	5407.39	6583.3]	
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95	;)m] x (4	1)m			
=m(89	3614.98	2731.02	2198.15	1132.83	379.26	0	0	0	0	1236.56	2536.44	3671.43		
								Tota	l per year	(kWh/yea) = Sum(9	(8) _{1.5,8.12} =	17500.67	
Spac	e heatin	g require	ement in	kWh/m ²	/year								29.35	٦
80.5	0000	olina rea	uiromor											_
	-	r June, J			See To	ble 10b								
Galoc	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Heat	loss rate	e Lm (ca			<i></i>	nal tem	perature			nperatur	e from T)	
(100)m=		0	0	0	0	4041.85		3252.77	0	0	0	0	ĺ	
Utilis	ation fac	tor for lo	oss hm										,	
(101)m=	0	0	0	0	0	0.91	0.96	0.94	0	0	0	0	1	
Usefi	ul loss, h	ımLm (V	Vatts) =	(100)m x	(101)m		•							
(102) <mark>m</mark> :	0	0	0	0	0	3659.04	3062.25	3069.69	0	0	0	0		
Gain	s (solar	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)				·	
(103) <mark>m</mark> :	0	0	0	0	0	4284.57	4123.49	3877.33	0	0	0	0		
Spac	e coolin	g require	ement fo	r month,	whole d	dwelling,	continu	ous (kV	(h) = 0.0	24 x [(10)3)m – (102)m]	x (41)m	
		zero if (<u> </u>	<u> </u>								,	
(104) <mark>m</mark> =	0	0	0	0	0	450.39	789.56	600.89	0	0	0	0		_
										= Sum(=	1840.84	
	d fractio	n actor (Ta	abla 10b						fC=	cooled	area + (4	4) =	1	
(106)m=	_			0	0	0.25	0.25	0.25	0	0	0	0	1	
(100)	L .	ů	Ů	ů,	Ů	0.20	0.20	0.20	-	I = Sum		=	0	
Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	m	1010	i – Guin	1000)	-	0	
(107)m=		0	0	0	0	112.6	197.39	150.22	0	0	0	0	1	
									Tota	I = Sum(107)	=	460.21	
	cooling	requirer	ment in k	(Wh/m²/	/ear) + (4) =	,		0.77	۲
Snace	ooomig	roquiroi			, oui				(, (.)			0.77	
· .			the land	defendence i he			م مالين بالم م	- milana (
9a. En		quiremer	nts – Ind	ividual h	eating s	ystems i	including	micro-C	HP)					
9a. En Spac	e heati	ng:							HP)				0	_
9a. En Spac Fract	tion of sp	ng: bace hea	at from s	econdar	y/supple		system							
9a. En Spac Fract Fract	tion of sp tion of sp tion of sp	ng: bace hea bace hea	at from s at from m	econdar nain syst	y/supple em(s)		system	(202) = 1	- (201) =	(2021) -			1	
9a. En Spac Fract Fract Fract	tion of sp tion of sp tion of sp tion of to	n g: bace hea bace hea tal heati	at from s at from m ng from	econdar nain syst main sys	y/supple em(s) stem 1		system		- (201) =	(203)] =				
9a. En Spac Fract Fract Fract	tion of sp tion of sp tion of sp tion of to	ng: bace hea bace hea	at from s at from m ng from	econdar nain syst main sys	y/supple em(s) stem 1		system	(202) = 1	- (201) =	(203)] =			1	
9a. En Spac Fract Fract Fract Effici	ce heatin tion of sp tion of sp tion of to ency of	n g: bace hea bace hea tal heati	at from s at from n ing from ace heat	econdar nain syst main sys ing syste	y/supple tem(s) stem 1 em 1	mentary	/ system	(202) = 1	- (201) =	(203)] =			1	
9a. En Spac Fract Fract Fract Effici Effici	tion of sp tion of sp tion of to ency of ency of	n g: bace hea bace hea tal heati main spa	at from s at from m ng from ace heat ary/suppl	econdar nain syst main sys ing syste ementar	y/supple em(s) stem 1 em 1 y heatin	mentary	/ system	(202) = 1	- (201) =	(203)] =			1 1 90.9	
9a. En Spac Fract Fract Fract Effici Effici	tion of sp tion of sp tion of to ency of ency of	ng: bace hea bace hea ital heatii main spa seconda	at from s at from m ng from ace heat ary/suppl	econdar nain syst main sys ing syste ementar	y/supple em(s) stem 1 em 1 y heatin	mentary	/ system	(202) = 1 (204) = (2	- (201) =	(203)] = Oct	Nov	Dec	1 1 90.9 0	
9a. En Spac Fract Fract Fract Effici Effici Cooli	tion of sp tion of sp tion of to ency of ency of ing Syste Jan	ng: bace hea bace hea ital heati main spa seconda em Ener	at from s at from n ng from ace heat ry/suppl gy Efficie Mar	econdar nain syst main syste ementar ency Rat Apr	y/supple tem(s) stem 1 em 1 y heatin tio May	g systen	r system n, %	(202) = 1	- (201) = 02) × [1 –		Nov	Dec	1 1 90.9 0 4.05	
9a. En Spac Fract Fract Fract Effici Effici Cooli	tion of sp tion of sp tion of to ency of ing Syste Jan e heatin	ng: bace hea bace hea ital heatii main spa seconda em Ener Feb	at from s at from n ng from ace heat ry/suppl gy Efficie Mar ement (c	econdar nain syst main syst ing syste ementar ency Rat Apr salculate	y/supple tem(s) stem 1 em 1 y heatin tio May	g systen	r system n, %	(202) = 1 (204) = (2	- (201) = 02) × [1 –		Nov 2536.44	Dec 3671.43	1 1 90.9 0 4.05	

- **26** | Sustainability and Energy Statement

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Total Control Control <thcontrol< th=""> <thcontrol< th=""> <thcon< th=""><th>3976.87 3004.43 2418.21 1246.24 4</th><th>)</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></thcon<></thcontrol<></thcontrol<>	3976.87 3004.43 2418.21 1246.24 4)								
Space heating fuel (secondary), KWh/month ((198) m x (2011)) x 100 + (208) 0 <td></td> <td>417.23</td> <td>0 0</td> <td>0</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>_</td>		417.23	0 0	0	0					_
([(38)m x (201)] x 100 + (208) 15mm 0				TOLA	ii (Kwinyei	ar) –ouni(.	(11) _{1_5,10_10}		19252.66	(21
Itsper 0 <td></td> <td>ionth</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		ionth								
Value free heating Unique from water heater (calculated above) 247.89 218.46 220.24 05.22 00.9 170.22 171.85 188.74 212.81 225.38 241.9 fficiency of water heater 80.8 80.8 80.8 80.8 80.28 80.98 90.2 (2 uel for water heating, KWh/month 219.01 200.09 220.58 221.81 122.86 233.85 233.50 233.41 250.47 288.17 Total = Sum(219, = 2802.34 (2 2802.34 (2 2802.34 (2 pace cooling fuel, KWh/month. 221.01 0		0	0 0	0	0	0	0	0		
butput from wrater heater (calculated above) 247.26 128.46 220.24 205.22 200.9 179.22 171.85 188.96 188.74 212.81 225.83 241.9 117.00 00.18 90.07 89.84 89.19 87.13 80.8 80.8 80.8 80.26 89.96 90.2 (2 117.00 00.18 90.07 89.84 89.19 87.13 80.8 80.8 80.26 89.96 90.2 (2 117.00 00.18 90.07 89.84 89.19 87.13 80.8 80.8 80.26 89.96 90.2 (2 117.00 10.18 90.07 89.84 20.95 221.81 21.268 233.55 23.61 20.047 269.47 (2 119.00 <	· · · · ·			Tota	il (kWh/yea	ar) =Sum(215) _{1.5,10.10}	-	0	(21
247.36 218.46 229.24 205.22 200.9 179.22 171.85 188.05 188.74 212.81 225.38 241.9 fficiency of water heating 00.7 99.44 99.19 67.13 80.8 80.8 80.8 80.8 80.2 80.9 90.2 (2 uel for water heating, KWh/month 119/m 219/m 218.41 220.47 228.41 220.47 228.17 228.24 255.16 20.00 20.58 221.81 212.66 233.85 233.41 250.47 268.17 2802.34 (2 ippec cooling fuel, KWh/month. 221/m 100.0 0 <td< td=""><td>Vater heating</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Vater heating									
fileiency of water heater 80.8			22 1718	188 95	188 74	212.81	225.38	241.0		
117 pm 90.18 90.07 92.84 80.18 90.2 (2 uel for water heating, KWh/month 121 pm (30.18 90.2 (2 119 pm (214) pm (24) x 100 + (217) mm 120 + (27) + (27) mm 120 + (27) + (2		200.0 110		100.00	100.14	212.01	220.00	241.0	80.8	7(21
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	· · · · · · · · · · · · · · · · · · ·	87.13 80	0.8 80.8	80.8	80.8	89.26	89.98	90.2		 (21
119)me 274.97 242.56 255.16 230.09 203.58 221.81 212.66 233.56 233.57 233.47 280.47 280.47 280.23 (2 Total = Sum(219a),, = 280.24 (2 Colspan="4">Colspan="4"Colspan="4">Colspan="4"Colspan="4">Colspan="4"Colspan="4">Colspan="4"Colspan="4"Colspan="4"Colspan="4">Colspan="4"Col	uel for water heating, kWh/month									
Total = Sum(219a),		220 50 220	04 0404	20 000 05	222 50	220.44	250.47	269.47		
pace cooling fuel, kWh/month. uture	214,57 242.30 233.10 230.05 2	230.30 22	212.0				230.47	200.17	2802 34	7(21
221m = (107)m+ (209) 221m = (107)m+ (209) 221m = (107)m+ (209) 21m = (107)m+ (209) annual totals manual totals machanical ventilation - balanced, extract or positive input from outside central heating pump: total = Sum(21), at the total = Sum(21), at thet	pace cooling fuel. kWh/month.					1.12			2002.04	
Innual totals Total = Sum(21), a 113.63 122.26 Innual totals KWhyear 122.26 122.26 pace cooling fuel used 113.63 113.63 113.63 Jacc control fuel used 113.63 113.63 113.63 Jacc control fuel used 113.63 113.63 113.63 Jacc control fuel used 2100.01 (22 220.01 (22 Jacc control fuel used 30 (22 220.01 (22 (22 (20.01) (22 (22 (22 (22.24) (21.02) (21.02) (21.02) (21.02) (22.02.01) (22.02) (22.02.01) (22.02) (22.02.01) (2	221)m = (107)m+ (209)									
kWh/year kWh/year kWh/year 12622.86 2402.34 12622.86 2402.34 12622.86 2402.34 12622.86 2402.34 12622.86 2402.34 12622.86 2402.34 12622.86 2402.34 12622.86 118.63 Idectricity for pumps, fans and electric keep-hot 2100.01 (22 central heating pump: 30 (22 cotal electricity for the above, kWh/year sum of (230s)(230g) = 2220.01 (22 idectricity for lighting 1153.03 (22 (22 (21 (230s)) (24)<	221)m= 0 0 0 0	0 27	.8 48.7				0	0		_
pace heating fuel used, main system 1 1222.68 Vater heating fuel used 2492.34 pace cooling fuel used 1138.33 lectricity for pumps, fans and electric keep-hot 2190.01 (2190.01) mechanical ventiliation - balanced, extract or positive input from outside 2190.01 (2190.01) central heating pump: 30 (21000) (21000) colat electricity for the above, kWh/year sum of (2300)(230g) = 2220.01 (21000) ilectricity for the above, kWh/year sum of (2300)(230g) = 2220.01 (21000)				Tota	il = Sum(2					<u> </u>
Vater heating fuel used 2802.34 pace cooling fuel used 113.83 Jectricity for pumps, fans and electric keep-hot 2190.01 mechanical ventilation - balanced, extract or positive input from outside 2190.01 central heating pump: 30 otal electricity for the above, KWhyear sum of (200a)(200g) = lectricity for lighting 2122.01 tz2. CO2 emissions - Individual heating systems including micro-CHP Emergy KWh/year kg CO2/kWh pace heating (main system 1) (21) x opace heating (secondary) (215) x opace and water heating (201) + (262) + (283) + (284) = pace cooling (221) x opace and water heating (21) x ipace cooling (221) x ipace cooling (221) x ipace cooling (221) x ipace theating 6519 ipace cooling (221) x ipace cooling (221) x ipace industric keep-hot (231) x ipaciticity for inghting (232) x ipaciticity for lighting (232) x <td></td> <td></td> <td></td> <td></td> <td></td> <td>k</td> <td>Wh/year</td> <td>· .</td> <td></td> <td>r</td>						k	Wh/year	· .		r
page cooling fuel used 118.63 lacticity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive input from outside 2100.01 (2 central heating pump: 30 (2 total electricity for the above, KWh/year sum of (230a)(230g) = 2220.01 (2 lacticity for lighting 1153.03 (2 1153.03 (2 1153.03 (2) 1153.03 (2) 1153.03 (2) 1153.03 (2) 12a. CO2 emissions - Individual heating systems including micro-CHP Emergy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year page heating (main system 1) (211) x 0.216 = 4158.57 (2 page heating (secondary) (215) x 0.519 = 0 (2 Vater heating (219) × 0.216 = 4458.57 (2 page and water heating (219) × 0.216 = 4458.57 (2 page cooling (211) x 0.519 = 58.88 (2 lactricity for pumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (2 lactricity for lighting (232) x 0.519 = 588.42 (2)										4
Bectricity for pumps, fans and electric keep-hot 2190.01 (2 mechanical ventilation - balanced, extract or positive input from outside 2190.01 (2 central heating pump: 30 (2 otal electricity for the above, kWh/year sum of (200s)(20g) = 22220.01 (2 ilectricity for lighting 1153.03 (2 12a. CO2 emissions – Individual heating systems including micro-CHP Emergy Emission factor Emissions pace heating (main system 1) (211) x 0.216 = 4158.57 (2 pace heating (secondary) (215) x 0.519 = 0.216 262.47.47 (2 pace and water heating (211) x 0.216 = 478.33.27 (2 pace cooling (221) x 0.519 = 58.98 (2 iectricity for pumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (2 iectricity for lighting (232) x 0.519 = 58.98 (2									2892.34	
mechanical ventilation - balanced, extract or positive input from outside 2190.01 (22) central heating pump: 30 (22) otal electricity for the above, kWh/year sum of $(220a)_{-}(220g) =$ 2220.01 (22) Bectricity for lighting 1153.03 (22) (22) (22) (22) 12a. CO2 emissions Individual heating systems including micro-CHP Energy Emission factor Kenssions Kg CO2/kWh Kg CO2/kyear $(210) \times$ 0.216 $=$ 4189.57 (22) pace heating (secondary) (215) x 0.216 $=$ 0.216										
Energy Emission factor Emissions 212a. CO2 emissions – Individual heating systems including micro-CHP Emission factor Emissions 212a. CO2 emissions – Individual heating systems including micro-CHP Emission factor Emissions 212a. CO2 emissions – Individual heating systems including micro-CHP Emission factor Emissions 212a. CO2 emissions – Individual heating systems including micro-CHP Emissions factor Emissions 212a cheating (main system 1) (211) x 0.216 = 4418.577 (212) 212a cheating (secondary) (215) x 0.519 = 0.216 = 642.474 (21) 212a cooling (221) x 0.519 = 0.216 = 642.474 (21) 212a cooling (221) x 0.519 = 56.88 (22) (221) (231) x 0.519 = 1152.19 (231) (231) x 0.519 = 1152.19 (232) (232) x 0.519 = 56.42 (24)	lectricity for pumps, fans and electric ke								113.63	
tight tight <th< td=""><td></td><td>sep-not</td><td></td><td></td><td></td><td></td><td></td><td></td><td>113.63</td><td></td></th<>		sep-not							113.63	
lectricity for lighting 113			ve input f	rom outside				2190.01	113.63	(23
Iza. CO2 emissions - Individual heating systems including micro-CHP Emission Emission factor kg CO2/kWh Emissions kg CO2/kWh Emissions kg CO2/kWh pace heating (main system 1) (21) x 0.216 = 4198.57 (21) pace heating (secondary) (215) x 0.519 = 0 (21) pace heating (secondary) (219) x 0.216 = 624.74 (21) pace and water heating (201) + (262) + (263) + (264) = (251) x 0.519 = 658.98 (21) pace cooling (221) x 0.519 = 1152.19 (21) (23) x 0.519 = 1152.19 (21) lectricity for lighting (232) x 0.519 = 596.42 (21)	mechanical ventilation - balanced, extra		ve input f	rom outside	e				113.63	
Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year pace heating (main system 1) (21) x 0.216 = 4158.57 (21) pace heating (secondary) (215) x 0.519 = 0 (21) valer heating (219) x 0.216 = 624.74 (21) pace and water heating (21) x 0.216 = 624.74 (21) pace cooling (221) x 0.519 = 658.98 (21) pace cooling (221) x 0.519 = 558.98 (21) electricity for jumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (21) electricity for lighting (232) x 0.519 = 598.42 (21)	mechanical ventilation - balanced, extra central heating pump:		ve input f			(230g) =				(23
kWhyear kg CO2/kWh kg CO2/year pace heating (main system 1) (211) x 0.216 = 4158.57 (21 pace heating (secondary) (215) x 0.519 = 0 (21 Vater heating (219) x 0.216 = 624.74 (21 pace and water heating (211) x 0.216 = 624.74 (21 pace cooling (221) x 0.519 = 658.98 (21 (21) x 0.519 = 558.98 (21) x 0.519 = 1152.19 (21) x 0.519 = 1152.19 (21) x 0.519 = 0.519 = 558.42 (21) x 0.519 = 5	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year		ve input f			(230g) =			2220.01	(23
kWhyear kg CO2/kWh kg CO2/year pace heating (main system 1) (211) x 0.216 = 4158.57 (21 pace heating (secondary) (215) x 0.519 = 0 (21 Vater heating (219) x 0.216 = 624.74 (21 pace and water heating (211) x 0.216 = 624.74 (21 pace cooling (221) x 0.519 = 658.98 (21 (21) x 0.519 = 558.98 (21) x 0.519 = 1152.19 (21) x 0.519 = 1152.19 (21) x 0.519 = 0.519 = 558.42 (21) x 0.519 = 5	mechanical ventilation - balanced, extra central heating pump: 'otal electricity for the above, kWh/year Electricity for lighting	act or positi		sum	of (230a).	(230g) =			2220.01	(23 (23](23](23
Jose heating (secondary) (215) x 0.519 = 0.216 (215) x 0.519 = 0.216 (215) x (215) x 0.216 (215) x	mechanical ventilation - balanced, extra central heating pump: 'otal electricity for the above, kWh/year lectricity for lighting	act or positi	including	sum micro-CHF	of (230a).			30	2220.01 1153.03	(23](23](23
(219) x 0.216 = 624.74 (2 pace and water heating (261) + (262) + (263) + (264) = 4783.32 (2 pace cooling (221) x 0.519 = 58.98 lectricity for pumps, fans and electric keep-hot (231) x 0.519 = 1152.19 electricity for lighting (232) x 0.519 = 598.42 (2	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year lectricity for lighting	act or positi	including Energy	sum micro-CHP	of (230a).	Emiss	ion fac	30	2220.01 1153.03 Emissions	(23 (23 (23 (23
pace and water heating (261) + (262) + (263) + (264) = (221) * 4763.32 (2 pace cooling (221) x 0.519 = 6898 (2 lectricity for jumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (2 lectricity for lighting (232) x 0.519 = 598.42 (2	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions – Individual heating	act or positi	including Energy kWh/ye	sum micro-CHP	of (230a).	Emiss kg CO	ion fac 2/kWh	30 tor	2220.01 1153.03 Emissions kg CO2/ye	(23](23](23](23] [23] [24] [25] [25] [26] [26] [26] [26] [26] [26] [26] [26
pace and water heating (261) + (262) + (263) + (264) = 4753.32 (2 pace cooling (221) x 0.519 = 68.98 (2 lectricity for pumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (2 lectricity for lighting (232) x 0.519 = 596.42 (2	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions – Individual heating pace heating (main system 1)	act or positi	including Energy kWh/yes (211) x	sum micro-CHP	of (230a).	Emiss kg CO	ion fac 2/kWh	30 tor =	2220.01 1153.03 Emissions kg CO2/ye 4158.57	(23](24](24 s sar](24
appe cooling (221) x 0.519 = 58.98 (2 lectricity for pumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (2 lectricity for lighting (232) x 0.519 = 598.42 (2	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions – Individual heating pace heating (main system 1) pace heating (secondary)	act or positi	including Energy kWh/yea (211) x (215) x	sum micro-CHP	of (230a).	Emiss kg CO	ion fac 2/kWh 16	30 tor =	2220.01 1153.03 Emissions kg CO2/ye 4158.57 0	(2:](2:](2: s sar](26
Lectricity for pumps, fans and electric keep-hot (231) x 0.519 = 1152.19 (24) Lectricity for lighting (232) x 0.519 = 598.42 (24)	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions - Individual heatin pace heating (main system 1) pace heating (secondary) /ater heating	act or positi	including Energy kWh/ye: (211) x (215) x (219) x	sum micro-CHF ar	of (230a).	Emiss kg CO	ion fac 2/kWh 16	30 tor =	2220.01 1153.03 Emissions kg CO2/ye 4158.57 0 624.74	(23](23](23 sar](26](26
Lectricity for lighting (232) x 0.519 = 598.42 (24)	mechanical ventilation - balanced, extra central heating pump: otal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions - Individual heating pace heating (main system 1) pace heating (secondary) /ater heating pace and water heating	act or positi	Energy kWh/ye: (211) x (215) x (219) x (261) + (26	sum micro-CHF ar	of (230a).	Emiss kg CO 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	30 tor = =	2220.01 1153.03 Emissions kg CO2/ye 4158.57 0 624.74 4783.32	(2: (2: (2: (2: sar (2: (2: (2: (2: (2: (2: (2: (2:
0.315 0.3042 (2	mechanical ventilation - balanced, extra central heating pump: lotal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions - Individual heating pace heating (main system 1) pace heating (secondary) Vater heating ipace and water heating ipace cooling	g systems	Energy kWh/ye. (211) x (215) x (219) x (261) + (26 (221) x	sum micro-CHF ar	of (230a).	Emiss kg CO 0.2 0.5 0.2	ion fac 2/kWh 16 19	30 tor = =	2220.01 1153.03 Emission: kg CO2/ye 4158.57 0 624.74 4783.32 58.98	(23 (23 (23 (23 (26 (26 (26 (26) (26)
otal CO2, kg/year sum of (265)(271) = 6592.9 (27	mechanical ventilation - balanced, extra central heating pump: lotal electricity for the above, kWh/year lectricity for lighting 12a. CO2 emissions – Individual heating pace heating (main system 1) pace heating (secondary) Vater heating ipace and water heating ipace cooling lectricity for pumps, fans and electric ke	g systems	including Energy kWh/ye: (211) x (215) x (219) x (261) + (26 (221) x (231) x	sum micro-CHF ar	of (230a).	Emiss kg CO 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	30 tor = = =	2220.01 1153.03 Emission: kg CO2/ye 4158.57 0 624.74 4783.22 58.98 1152.19	(23 (22 (22 (23 (22 (26 (26 (26) (26) (26)

DER WorkSheet: New dwelling design stage

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 8 of 9

DER WorkSheet: New dwelling design stage

(272) + (4) =

Dwelling CO2 Emission Rate El rating (section 14)

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

11.06 (273) 86 (274)

Page 9 of 9

DRAFT

Assessor Name: Software Name:	Stroma FSAP 2012	Stroma Nu Software		ion: 1.0.4.25
Address :	ł	Property Address: 5B I	Prince Arthur Road_Be Le	an
1. Overall dwelling dime	nsions:			
		Area(m ²)	Av. Height(m)	Volume(m ³)
Basement		177.5 (1a)	x 4 (2a) =	710 (3a)
Ground floor		155 (1b)	x 3.1 (2b) =	480.5 (3b)
irst floor		131.9 (1c)	x 2.7 (2c) =	356.13 (3c)
Second floor		131.9 (1d)	x 2.6 (2d) =	342.94 (3d)
otal floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 596.3 (4)		
welling volume		(3a) [,]	+(3b)+(3c)+(3d)+(3e)+(3n) =	1889.57 (5)
2. Ventilation rate:				
	main seconda heating heating	ry other	total	m ³ per hour
lumber of chimneys	0 + 0	+ 0 =	0 x 40 =	0 (6a)
Number of open flues	0 + 0	- +	0 × 20 =	0 (6b)
Number of intermittent fa	ns		4 x 10 =	40 (7a)
lumber of passive vents			0 × 10 =	0 (7b)
lumber of flueless gas fi	res		0 ×40 =	0 (7c)
			Air	changes per hour
nfiltration due to chimne	ys, flues and fans = (6a)+(6b)+	7a)+(7b)+(7c) =	40 + (5) =	0.02 (8)
	een carried out or is intended, proce	ed to (17), otherwise continu	ue from (9) to (16)	
Number of storeys in the Additional infiltration	ne dwelling (ns)			0 (9)
			[(9)-1]x0.1 =	
	.25 for steel or timber frame or resent, use the value corresponding to			0 (11)
deducting areas of openir		o ne greater nan area (and		
If suspended wooden f	loor, enter 0.2 (unsealed) or 0	0.1 (sealed), else ente	r 0	0 (12)
If no draught lobby, en	ter 0.05, else enter 0			0 (13)
Percentage of windows	s and doors draught stripped			0 (14)
Window infiltration		0.25 - [0.2 x (14	+ 100] =	0 (15)
Infiltration rate		(8) + (10) + (11)	+ (12) + (13) + (15) =	0 (16)
Air permeability value,	q50, expressed in cubic metr	es per hour per square	e metre of envelope area	5 (17)
based on air permeabil	ity value, then (18) = [(17) + 20]+	(8), otherwise (18) = (16)		0.27 (18)
Air permeability value applie	s if a pressurisation test has been do	ne or a degree air permeat	ility is being used	
umber of sides sheltere	d			2 (19)
helter factor		(20) = 1 - [0.075	x (19)] =	0.85 (20)
nfiltration rate incorporat	ing shelter factor	(21) = (18) x (20) =	0.23 (21)
nfiltration rate modified f	or monthly wind speed			

TER WorkSheet: New dwelling design stage

TER WorkSheet: New dwelling design stage

	<u> </u>		om Tabl									-		
(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7			
Wind Factor (2	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	1		
							(04)	(00)				-		
Adjusted infiltr	0.29	e (allowi	0.25	0.25	0.22	peed) =	(21a) x	(22a)m	0.25	0.26	0.27	1		
Calculate effe							0.21	0.23	0.25	0.20	0.27			
If mechanic	al ventila	tion:											0	(23)
lf exhaust air h	eat pump u	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)				0	(23
If balanced with	h heat reco	very: effici	iency in %	allowing f	for in-use f	actor (fror	n Table 4h) =					0	(23
a) If balance	ed mecha	anical ve	ntilation	with he	at recov	ery (MV	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c) ÷ 100]		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
b) If balance							MV) (24b)m = (2	2b)m + (:	. ,		-		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
c) If whole h									- (
	n < 0.5 ×	(23b), t	0 hen	c) = (23b	o); othen	wise (24	c) = (22t	5)m+0	.5 × (23b			1		(24
			-	-			L ů	-	0	0	0			(24
d) If natural if (22b)r	ventilation m = 1, the								0.51					
24d)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	1		(24
Effective air	change	rate - er	nter (24a) or (24t) or (24	c) or (24	d) in box	(25)	-		-			
_	5-			, (
(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	1		(25
	1				0.52	0.52	0.52	0.53	0.53	0.53	0.54]		(25
3. Heat losse	es and he	at loss p	paramete	er:			1			0.53	1]		
	1	at loss p		er: gs	0.52 Net Ar	ea	0.52 U-valı W/m2	Je	0.53 A X U (W/		0.54 k-valu kJ/m ^{2.}		A) kJ/	Xk
3. Heat losse	s and he Gros	at loss p	paramete Openin	er: gs	Net Ar	ea	U-val	Je	AXU		k-valu			X k /K
3. Heat losse	es and he Gros area	at loss p	paramete Openin	er: gs	Net Ar A ,r	ea n²	U-valı W/m2	ue K	A X U (W/		k-valu			X k /K (26
3. Heat losse ELEMENT Doors	es and he Gross area	at loss p	paramete Openin	er: gs	Net Ar A ,r 5.7	ea m² x	U-valı W/m2	ue !K = 0.04] =	A X U (W/I 5.7		k-valu			X k /K (26 (27
3. Heat losse ELEMENT Doors Windows Type	es and he Gros area e 1 e 2	at loss p	paramete Openin	er: gs	Net Ar A ,r 5.7 20.3	ea n ² x x1 x1	U-vali W/m2	ue K 0.04] = 0.04] =	A X U (W/ 5.7 26.91		k-valu			X k /K (26 (27 (27
3. Heat losse ELEMENT Doors Windows Type	e 1 e 2 be 1	at loss p	paramete Openin	er: gs	Net Ar A ,r 5.7 20.3 53.4	ea m ² x x1 x1 x1	U-valı W/m2 1 /[1/(1.4)+	ue !K 0.04] = 0.04] = 0.04] =	A X U (W/I 5.7 26.91 70.8		k-valu			X k /K (26 (27 (27 (27
3. Heat losse ELEMENT Doors Windows Type Rooflights Type	e 1 e 2 be 1	at loss p	paramete Openin	er: gs	Net Ar A ,r 5.7 20.3 53.4 0.8	ea m ² x1 x1 x1 x1 x1	U-vali W/m2 1 1[1/(1.4)+ 1[1/(1.4)+ 1[1/(1.7)+	ue !K 0.04] = 0.04] = 0.04] =	A X U (W/I 5.7 26.91 70.8 1.36		k-valu			X k (26 (27 (27 (27
3. Heat losse ELEMENT Doors Windows Type Windows Type Rooflights Typ Rooflights Typ	e 1 e 2 be 1	at loss p is (m²)	paramete Openin	er: gs ²	Net Ar A,r 5.7 20.3 53.4 0.8 1.3	ea m ² x1 x1 x1 x1 x1	U-valı W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+	ue K 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/ 5.7 26.91 70.8 1.36 2.21		k-valu			X k (26 (27 (27) (27) (28)
3. Heat losse ELEMENT Doors Windows Type Rooflights Typ Rooflights Typ Floor	e 1 e 2 be 2	at loss ; is (m ²)	Openin rr	er: gs ²	Net Ar A,r 5.7 20.3 53.4 0.8 1.3 177.5 216	ea m ² x 1 x1 x1 x1 x1 x1 x1 x1 x1	U-valı W/m2 1 /[1/(1.4)+ /[1/(1.7) + /[1/(1.7) + /[1/(1.7) + 0.13 0.18	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/ 5.7 26.91 70.8 1.36 2.21 23.075		k-valu			X k (26 (27) (27) (27) (28) (28)
3. Heat losse ELEMENT Doors Windows Type Rooflights Typ Rooflights Typ Floor Walls Type1	e and he Gros area e 1 e 2 oe 1 oe 2 295. 129.2	at loss p is (m ²)	Openin Openin m	er: gs ²	Net Ar A,r 5.7 20.3 53.4 0.8 1.3 177.5 216 129.2	ea m ² x 1 x 1 x 1 x 1 x 2 x 2	U-valı W/m2 1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7) + /[1/(1.7) + 0.13 0.18 0.18	ue K 0.04] = 0.04] = 0.04] = 0.04] = 1 = 1 =	A X U (W/I 5.7 26.91 70.8 1.36 2.21 23.075 38.88 23.26		k-valu			X k (26 (27 (27 (27) (27) (28) (29) (29)
3. Heat losse ELEMENT Doors Windows Type Windows Type Rooflights Typ Floor Walls Type1 Walls Type2 Walls Type3	e and he Gros area e 1 e 2 be 1 be 2 295. [294] 226.	at loss p s (m ²)	Openin m 79.4	er: gs ²	Net Ar A,r 5.7 20.3 53.4 0.8 1.3 177.5 216	ea m ² x 1 x 1 x 1 x 1 x 2 x 2	U-vali W/m2 1 /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	Je K 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	A X U (W/I 5.7 26.91 70.8 1.36 2.21 23.075 38.88 23.26 40.75		k-valu			X k (26 (27) (27) (27) (28) (29) (29) (29) (29) (29)
3. Heat losse ELEMENT Doors Windows Type Rooflights Type Rooflights Type1 Walls Type1 Walls Type2 Walls Type3 Roof Type1	e 1 e 1 e 2 e 2 295. 129.1 226. 136.	4 1	0penin rr 79.4 0 0	er: gs ²	Net Ar A, r 5.7 20.3 53.4 0.8 1.3 177.5 216 129.2 226.4 134	ea m ² x 1 x 1 x 1 x 1 x 2 x 2	U-vali W/m2 1 /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18 0.13	Je K 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	A X U (W/ 5.7 26.91 70.8 1.36 2.21 23.075 38.88 23.26 40.75 17.42		k-valu			X k (26 (27 (27) (27) (27) (28) (29) (29) (29) (29) (29) (29) (29) (29
3. Heat losse ELEMENT Doors Windows Type Rooflights Typ Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2	e 1 e 2 be 1 226. 136. 18.5	4 4 1 9	Openin m 79.4	er: gs ²	Net Ar A, r 5.7 20.3 53.4 0.8 1.3 177.5 216 129.2 226.4 134 18.9	ea 11 ² x 1 1 x1 1 x1 5 x x 2 x x 1 x x 1 x x	U-vali W/m2 1 /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18	Le K = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	A X U (W/I 5.7 26.91 70.8 1.36 2.21 23.075 38.88 23.26 40.75		k-valu			X k (26 (27) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (29
3. Heat losse ELEMENT Doors Windows Type Windows Type Rooflights Typ Floor Walls Type 1 Walls Type 2 Walls Type 3 Roof Type 1 Roof Type 2 Total area of e	e 1 e 2 e 2 295. 226. 136. 136. 18.5	4 4 1 9 m ²	279.4 Openin m 0 0 2.1 0	97: gs 2 ²	Net Ar A, r 5.7 20.3 53.4 0.8 1.3 177.5 216 129.2 226.4 134 18.9 983.5	ea m ² x 1 x 1 x 1 x 1 x 2 x x x 2 x x x 2 x x 2	U-valı W/m2 1 [1/(1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18 0.13 0.13	ue K = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = =	A X U (W/I 5.7 26.91 70.8 1.36 2.21 23.075 38.88 23.26 40.75 17.42 2.46		k-valu kJ/m ²			X k (26 (27) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (29
3. Heat losse ELEMENT Doors Windows Type Rooflights Typ Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2	e 1 e 2 e 2 295. 129.2 226. 136. 18.5 elements.	4 1 , m ² wws. use e	Openin Openin m 79.4 0 0 2.1 0	er: gs 2	Net Ar A,r 5.7 20.3 53.4 0.8 1.3 177.5 216 129.2 226.4 134 18.9 983.5 slue calcul	ea m ² x 1 x 1 x 1 x 1 x 2 x x x 2 x x x 2 x x 2	U-valı W/m2 1 [1/(1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ /[1/(1.7)+ /[1/(1.7)+ 0.13 0.18 0.18 0.18 0.13 0.13	ue K = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = =	A X U (W/I 5.7 26.91 70.8 1.36 2.21 23.075 38.88 23.26 40.75 17.42 2.46		k-valu kJ/m ²			

Heat capac Thermal m For design as a can be used i Thermal br if details of the (33)m = (40)m = Energy conte (45)m= 192 If instantaneous (46)m= 28.81 Water storag Storage volu If community Otherwise if Water storag a) If manufa Temperature Energy lost f b) If manufa

Page 2 of 8

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 1 of 8

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

5B PRINCE ARTHUR ROAD | HAMPSTEAD

TER WorkSheet: New dwelling design stage

pacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
mass	parame	ter (TMF	⊃ = Cm +	⊢ TFA) ir	n kJ/m²K			Indica	tive Value:	Medium	Ī	250	(35)
	sments wh ad of a dei			construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
bridge	es : S (L	x Y) cal	culated	using Ap	pendix	к					[49.2	(36)
f therma	al bridging	are not kn	iown (36) =	= 0.05 x (3	1)								
oric he	at loss							(33) +	(36) =		[301.79	(37)
on hea	at loss ca	alculated	d monthly	у				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
338.71	337.66	336.64	331.82	330.92	326.73	326.73	325.95	328.34	330.92	332.74	334.65		(38)
_	coefficier	<u> </u>							= (37) + (3	<u> </u>			
640.5	639.45	638.43	633.62	632.72	628.52	628.52	627.75	630.14	632.72	634.54	636.44		_
s para	meter (H	HLP), W	/m²K	-					Average = = (39)m +		.u /12=	633.61	(39)
1.07	1.07	1.07	1.06	1.06	1.05	1.05	1.05	1.06	1.06	1.06	1.07		
of day	/s in mor	nth (Tab	le 1a)						Average =	Sum(40)	nº /12=	1.06	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		(41)
_													
er heat	ting ener	rgy requ	irement:								kWh/ye	ear:	
> 13.9	upancy, I 9, N = 1 9, N = 1		(1 - exp	(-0.0003	49 x (TI	-A -13.9)2)] + 0.(0013 x (TFA -13.		52		(42)
e annua	al average	hot water	usage by		welling is	designed t	(25 x N) to achieve		se target of	11	7.73		(43)
Jan	Feb	Mar day for ea	Apr ach month	May Vd,m = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
-													
129.5	124.8	120.09	115.38	110.67	105.96	105.96	110.67	115.38	120.09	124.8	129.5		(44)
ntent of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600		Total = Su ath (see Ta			1412.78	_(**)
192.05	167.97	173.33	151.11	145	125.12	115.94	133.05	134.64	156.9	171.27	185.99		_
neous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45)112 =	-	1852.38	(45)
28.81	25.2	26	22.67	21.75	18.77	17.39	19.96	20.2	23.54	25.69	27.9		(46)
orage volum		includir	n anv si	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
unity h	eating a stored	ind no ta	ank in dw	velling, e	nter 110) litres in				L	130		(47)
nufact	urer's de	eclared I	oss fact	or is kno	wn (kWl	n/day):				1.	39		(48)
ature f	actor fro	m Table	2b							0.	54		(49)
			, kWh/ye		or is not		(48) x (49)) =		_	75		(50)
				ear loss fact	or is not		(48) x (49)) =		0.	75		(5

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 3 of 8

A3 | DER/TER Worksheets

TER WorkSheet: New dwelling design stage

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 4 of 8

Hot water stor	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ay)					0	1	(51
f community I			on 4.3										
/olume factor											0		(52
Femperature 1	factor fro	m Table	2b								0		(53
Energy lost fro			, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54
Enter (50) or	. , .	·								0.	.75		(58
Nater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	1	(56
f cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ((H11)] + (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	1	(57
Primarv circui	t loss (ar	inual) fro	m Table	3							0	i	(5)
rimary circui	t loss cal	, culated t	for each	month (59)m = ((58) ÷ 36	5 × (41)	m		· · · · ·			
(modified by	y factor fi	om Tab	le H5 if t	here is s	olar wa	ter heati	ng and a	cylinde	r thermo	stat)			
59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	1	(5)
Combi loss ca	lculated	for each	month ((61)m =	(60) ÷ 3(65 × (41)m						
61)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(6
Fotal heat req	uired for	water h	aating cs	lculated	l for eac	h month	(62)m =	0.85 x /	(15)m +	(46)m +	(57)m +	(50)m + (6	1)m
62)m= 238.65		219.92	196.2	191.59	170.21	162.54	179.64	179.73	203.5	216.37	232.59	(<i>33)</i>	(6
Solar DHW input													
add additiona									Contribut	ION to wate	a neaung)		-
			_	_		_	_	<u> </u>	0	_		1	
63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(6
Dutput from w		_		_									
54)m= 238.65	210.06	219.92											
200.00	210.00	219.92	196.2	191.59	170.21	162.54	179.64	179.73	203.5	216.37	232.59		
200.00	210.06	219.92	196.2	191.59	170.21	162.54		179.73 out from w	_			2400.9) (6
							Out	out from w	ater heate	(annual)	12) (6
leat gains fro							Out	out from w	ater heate	(annual)	12		
leat gains fro	m water 89.52	heating, 94.91	kWh/m 86.32	onth 0.2 85.49	5 ′ [0.85 77.68	× (45)m 75.83	Out; + (61)m 81.51	out from wa n] + 0.8 x 80.84	ater heate ((46)m 89.45	+ (57)m 93.02	+ (59)m]	
Heat gains fro 65)m= 101.13 include (57)	m water 89.52 m in calo	heating, 94.91	kWh/me 86.32 of (65)m	onth 0.25 85.49 only if c	5 ′ [0.85 77.68	× (45)m 75.83	Out; + (61)m 81.51	out from wa n] + 0.8 x 80.84	ater heate ((46)m 89.45	+ (57)m 93.02	+ (59)m]	
Heat gains fro 65)m= 101.13 include (57) 5. Internal g	m water 89.52 m in calc ains (see	heating, 94.91 culation o	kWh/m 86.32 of (65)m and 5a	onth 0.25 85.49 only if c	5 ′ [0.85 77.68	× (45)m 75.83	Out; + (61)m 81.51	out from wa n] + 0.8 x 80.84	ater heate ((46)m 89.45	+ (57)m 93.02	+ (59)m]	
Heat gains fro 65)m= 101.13 include (57) 5. Internal g Metabo <u>lic gain</u>	m water 89.52 m in calo ains (see	heating, 94.91 culation o Table 5	kWh/me 86.32 of (65)m and 5a	onth 0.29 85.49 only if c	5 ' [0.85 77.68 ylinder i	× (45)m 75.83 s in the o	Out; + (61)m 81.51 dwelling	out from wa a] + 0.8 3 80.84 or hot w	ater heater ((46)m 89.45 ater is fr	(annual)+ + (57)m 93.02 rom com	+ (59)m 99.12 munity h]	
Heat gains fro 35)m= 101.13 include (57) 5. Internal g Metabolic gain Jan	m water 89.52 m in calo ains (see hs (Table Feb	heating, 94.91 culation of Table 5 5), Wat Mar	kWh/me 86.32 of (65)m and 5a ts Apr	onth 0.29 85.49 only if c	5 ' [0.85 77.68 ylinder i Jun	× (45)m 75.83 s in the o	Out; + (61)m 81.51 dwelling Aug	out from wa 1] + 0.8 3 80.84 or hot w Sep	ater heater ((46)m 89.45 ater is fr	(annual), + (57)m 93.02 om com	+ (59)m 99.12 munity h]	(6
teat gains fro 55)m= 101.13 include (57) 5. Internal g Aetabolic gain Jan 56)m= 175.86	m water 89.52 Im in calo ains (see rs (Table Feb 175.86	heating, 94.91 culation of Table 5 5), Wat Mar 175.86	kWh/m 86.32 of (65)m and 5a ts Apr 175.86	onth 0.29 85.49 only if c): May 175.86	5 ' [0.85 77.68 ylinder i Jun 175.86	× (45)m 75.83 s in the o Jul 175.86	Outp + (61)m 81.51 dwelling Aug 175.86	bet from water a] + 0.8 > 80.84 or hot w Sep 175.86	ater heater ((46)m 89.45 ater is fr	(annual)+ + (57)m 93.02 rom com	+ (59)m 99.12 munity h]	(6
teat gains fro 55)m= 101.13 include (57) 5. Internal g Aletabolic gain 36)m= 175.86 ighting gains	m water 89.52 m in calo ains (see s (Table Feb 175.86 (calcula	heating, 94.91 culation o Table 5 5), Wat Mar 175.86 ted in Ap	kWh/me 86.32 of (65)m and 5a ts Apr 175.86 opendix	0.23 85.49 only if c : May 175.86 L, equati	5 1 [0.85 77.68 ylinder i Jun 175.86 ion L9 o	× (45)m 75.83 s in the o Jul 175.86 r L9a), a	Outy + (61)rr 81.51 dwelling Aug 175.86 Iso see	80.84 a) + 0.8 3 80.84 or hot w Sep 175.86 Table 5	ater heater ((46)m 89.45 ater is fr Oct 175.86	(annual), + (57)m 93.02 om com Nov 175.86	+ (59)m 99.12 munity h Dec 175.86]	(6
teat gains fro 55)m= 101.13 include (57) 5. Internal g Aletabolic gain 56)m= 175.86 ighting gains	m water 89.52 Im in calo ains (see rs (Table Feb 175.86	heating, 94.91 culation of Table 5 5), Wat Mar 175.86	kWh/m 86.32 of (65)m and 5a ts Apr 175.86	onth 0.29 85.49 only if c): May 175.86	5 ' [0.85 77.68 ylinder i Jun 175.86	× (45)m 75.83 s in the o Jul 175.86	Outp + (61)m 81.51 dwelling Aug 175.86	bet from water a] + 0.8 > 80.84 or hot w Sep 175.86	ater heater ((46)m 89.45 ater is fr	(annual), + (57)m 93.02 om com	+ (59)m 99.12 munity h]	(6
Heat gains fro 65)m= 101.13 include (57) 5. Internal g Metabolic gain G60)m= 175.86 Lighting gains 65.29	m water 89.52 m in cald ains (see Feb 175.86 (calcula 57.99	heating, 94.91 culation of 5), Wat 175.86 ted in Ap 47.16	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7	00000000000000000000000000000000000000	5 1 [0.85 77.68 ylinder i Jun 175.86 ion L9 o 22.53	× (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35	Outp + (61)m 81.51 dwelling 175.86 Iso see 31.65	aut from washing + 0.8 automatic 80.84 or hot washing or hot washing Sep 175.86 Table 5 42.48	Oct 175.86 53.93	(annual), + (57)m 93.02 om com Nov 175.86	+ (59)m 99.12 munity h Dec 175.86]	(6
Heat gains fro 65)m= 101.13 include (57) 5. Internal g Metabolic gain Jan 66)m= 175.86 Lighting gains 67)m= 65.29 Appliances ga	m water 89.52 m in cald ains (see Feb 175.86 (calcula 57.99	heating, 94.91 culation of 5), Wat 175.86 ted in Ap 47.16	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7	00000000000000000000000000000000000000	5 1 [0.85 77.68 ylinder i Jun 175.86 ion L9 o 22.53	× (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35	Outp + (61)m 81.51 dwelling 175.86 Iso see 31.65	aut from washing + 0.8 automatic 80.84 or hot washing or hot washing Sep 175.86 Table 5 42.48	Oct 175.86 53.93	(annual), + (57)m 93.02 om com Nov 175.86	+ (59)m 99.12 munity h Dec 175.86]	(6 (6
teat gains fro 55)m= 101.13 include (57) 5. Internal g Metabolic gain 56)m= 175.86 ighting gains 57)m= 65.29 Appliances ga 88)m= 669.12	m water 89.52 m in cald ains (see Feb 175.86 (calcula 57.99 iins (calc 676.06	heating, 94.91 sulation of Table 5 5), Wat 175.86 ted in Ap 47.16 ulated in 658.56	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7 Append 621.31	May 175.86 L, equati 26.69 574.29	5 ' [0.85 77.68 ylinder i Jun 175.86 ion L9 o 22.53 uation L 530.1	x (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58	Out; + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64	aut from washing + 0.8 x 80.84 or hot washing or hot washing Sep 175.86 Table 5 42.48 o see Tal 511.13 Sep	ater heater ((46)m 89.45 ater is fr Oct 175.86 53.93 ble 5 548.38	(annual), + (57)m 93.02 om com Nov 175.86 62.95	+ (59)m 99.12 munity h Dec 175.86]	(6 (6
leat gains fro signa (10.13) include (57) 5. Internal g letabolic gains ighting gains ight	m water 89.52 m in cald ains (see Feb 175.86 (calcula 57.99 iins (calc 676.06	heating, 94.91 sulation of Table 5 5), Wat 175.86 ted in Ap 47.16 ulated in 658.56	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7 Append 621.31	May 175.86 L, equati 26.69 574.29	5 ' [0.85 77.68 ylinder i Jun 175.86 ion L9 o 22.53 uation L 530.1	x (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58	Out; + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64	aut from washing + 0.8 x 80.84 or hot washing or hot washing Sep 175.86 Table 5 42.48 o see Tal 511.13 Sep	ater heater ((46)m 89.45 ater is fr Oct 175.86 53.93 ble 5 548.38	(annual), + (57)m 93.02 om com Nov 175.86 62.95	+ (59)m 99.12 munity h Dec 175.86]	(6 (6 (6
Jeat gains fro j5jm= 101.13 include (57) 5. Internal g Jan j6jm= 175.86 ighting gains 77m= 65.29 ppllances ga i8)m= 669.12 cooking gains 60.12 cooking gains 40.59	m water 89.52 m in cala ains (see 57.99 ins (calcula 57.99 ins (calcula 676.06 6 (calcula 40.59	heating, 94.91 culation of Table 5 5), Wat 175.86 ted in Ap 47.16 ulated in 658.56 ted in A 40.59	kWh/me 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7 o Appendix 621.31 opendix 40.59	May 175.86 L, equati 26.69 dix L, equati 574.29 L, equati	5 ' [0.85 77.68 ylinder i Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15	× (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a	Out; + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se	sout from we a] + 0.8 80.84 or hot w Sep 175.86 Table 5 42.48 o see Tai 511.13 see Table	Oct 175.86 53.93 ble 5 548.38 5	(annual), + (57)m 93.02 om com Nov 175.86 62.95 595.4	+ (59)m 99.12 munity h Dec 175.86 67.1 639.59]	(6 (6 (6
Jeal gains fro s5pm= 101.13 include (57) 5. Internal g Metabolic gain Jan 36)m= 175.86 sighting gains 57/m= 65.29 Japhines gains 38)m= 66.91 cooking gains 39/m= 40.99 Pumps and fa	m water 89.52 m in cala ains (see 57.99 ins (calcula 57.99 ins (calcula 676.06 6 (calcula 40.59	heating, 94.91 culation of Table 5 5), Wat 175.86 ted in Ap 47.16 ulated in 658.56 ted in A 40.59	kWh/me 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7 o Appendix 621.31 opendix 40.59	May 175.86 L, equati 26.69 dix L, equati 574.29 L, equati	5 ' [0.85 77.68 ylinder i Jun 175.86 ion L9 o 22.53 uation L 530.1 ion L15	× (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a	Out; + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se	sout from we a] + 0.8 80.84 or hot w Sep 175.86 Table 5 42.48 o see Tai 511.13 see Table	Oct 175.86 53.93 ble 5 548.38 5	(annual), + (57)m 93.02 om com Nov 175.86 62.95 595.4	+ (59)m 99.12 munity h Dec 175.86 67.1 639.59]	(6 (6 (6 (6
Jeal gains fro styme 101.13 sinclude (57) 5. Internal g Atabolic gain Jann 36)me 175.86 sighting gains 57/me 52)me 669.12 Zooking gains 59/me 99/me 0.59 (99/me) 99/me 0.59 (99/me) 90/me 3	m water 89.52 m in calc ains (see rs (Table Feb 175.86 (calcula 57.99 ins (calc 676.06 s (calcula 40.59 ns gains 3	heating, 94.91 culation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ited in A 40.59 (Table 5 3	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7 Appendix 621.31 opendix 40.59 5a) 3	00000000000000000000000000000000000000	5 1 [0.85 77.68 ylinder i 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59 3	x (45)m 75.83 s in the o 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Out; + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	sout from we all + 0.8 80.84 or hot w Sep 175.86 Table 5 42.48 o see Tal 511.13 se Table 40.59	Oct 175.86 53.93 5 548.38 5 40.59	(annual), + (57)m 93.02 om com 175.86 62.95 595.4 40.59	+ (59)m 99.12 munity h 175.86 67.1 639.59 40.59]	(6 (6 (6 (6
Heat gains froc 559me 101.13 include (57) 5. 5. Internal g detabolic gains 175.86 960me 175.86 960me 65.29 hyppliances ga 590me 65.29 200king gains 599me 66.912 200king gains 669.12 200king gains 64.92 200king gains 609.12	m water 89.52 m in cala ains (see ns (Table Feb 175.86 (calcula 57.99 nins (calc 676.06 a (calcula 40.59 ns gains 3 vaporatic	heating, 94.91 culation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 tted in Ar 40.59 (Table 5 3 nn (negative)	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 ppendix 35.7 Appendix 40.59 5a) 3 tive valu	onth 0.23 85.49 only if c : 175.86 L, equati 26.69 Jix L, equati 40.59 L, equati 40.59	5 1 [0.85 77.68 ylinder i 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59 3 le 5)	x (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Outp + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	set from work 80.84 or hot w Sep 175.86 Table 5 42.48 o see Tai 511.13 se Table 40.59 3	Oct 175.86 53.93 ble 5 548.38 5 40.59	(annual): + (57)m 93.02 om com Nov 175.86 62.95 595.4 40.59 3	+ (59)m 99.12 munity h Dec 175.86 67.1 639.59 40.59 3]	(6 (6 (6 (6 (7
Leat gains froz 65pmc 101.13 include (57) 5 Jan 175.86 detabolic gain Jan 66pmc 175.86 dphtng gains 66.92 Cooking gains 66.92 Cooking gains and fa 50.90 70pmc 63.92 Pumps and fa 70pmc 70pmc 3 71pmc -140.68	m water 89.52 m in cala 89.52 m in cala ains (see reb 175.86 (calcula 57.99 tins (calc 676.06 a (calcula 40.59 ns gains 3 vaporatic -140.68	heating, 94.91 2014tion of 7 Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in Ap 47.16 ulated in Ap 40.59 (Table 5 3 nn (negal -140.68	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 opendix 35.7 Appendix 621.31 opendix 40.59 5a) 3	00000000000000000000000000000000000000	5 1 [0.85 77.68 ylinder i 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59 3	x (45)m 75.83 s in the o 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Out; + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	sout from we all + 0.8 80.84 or hot w Sep 175.86 Table 5 42.48 o see Tal 511.13 se Table 40.59	Oct 175.86 53.93 5 548.38 5 40.59	(annual), + (57)m 93.02 om com 175.86 62.95 595.4 40.59	+ (59)m 99.12 munity h 175.86 67.1 639.59 40.59]	a) (
Heat gains froc 655me 101.13 include (57) 5 Internal g Jan 660me 175.86 660me 670me 652.92 Appliances ga Appliances ga 669.12 Cooking gains 669.12 Cooking gains 669.12 Cooking gains 60.91 Cooking gains 6.92 Dumps and fa 0.90mg Onome 3 cosses e.g. et et	m water 89.52 m in cala 89.52 m in cala ains (see reb 175.86 (calcula 57.99 tins (calc 676.06 a (calcula 40.59 ns gains 3 vaporatic -140.68	heating, 94.91 2014tion of 7 Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in Ap 47.16 ulated in Ap 40.59 (Table 5 3 nn (negal -140.68	kWh/ma 86.32 of (65)m and 5a ts Apr 175.86 ppendix 35.7 Appendix 40.59 5a) 3 tive valu	onth 0.23 85.49 only if c : 175.86 L, equati 26.69 Jix L, equati 40.59 L, equati 40.59	5 1 [0.85 77.68 ylinder i 175.86 ion L9 o 22.53 uation L 530.1 ion L15 40.59 3 ide 5)	x (45)m 75.83 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Outp + (61)m 81.51 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se 40.59	set from work 80.84 or hot w Sep 175.86 Table 5 42.48 o see Tai 511.13 se Table 40.59 3	Oct 175.86 53.93 ble 5 548.38 5 40.59	(annual): + (57)m 93.02 om com Nov 175.86 62.95 595.4 40.59 3	+ (59)m 99.12 munity h Dec 175.86 67.1 639.59 40.59 3]	(6 (6 (6 (6 (7

TER WorkSheet: New dwelling design stage

Total internal gains = (66/m + (67/m + (68)m + (69)m + (71)m + (71)m + (72)m (73)m= 948.09 946.02 912.05 855.66 794.64 739.27 705.6 713.6 744.64 801.29 866.3 918.68 6 Solar Solar gains Orientation: Access Factor Area m² Flux Table 6a FF Table 6c Gains (W) g_ Table 6b Table 6d 600.47 1022.81 1399.46 1734 36.79 0.63 0.7 Southeast 53.4 0.63 0.63 0.7 Southeast 53.4 62.67 0.77 53.4 85.75 Southeast 106.25 0.63 53.4 0.63 0.63 0.63 0.63 0.63 0.63 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 1942.22 1928.18 1858.97 1703.62 119.01 118.15 Southeast 0 0.77 53.4 0.77 53.4 Southeast 113.91 53.4 104.39 92.85 69.27 Southeast 0 0.77 53.4 1515.32 1130.43 0.77 53.4 Southeast 53.4 0.77 44.07 0.63 0.7 53.4 31.49 0.63 36.79 0.7 20.3 0.63 0.7 0.7 0.7 0.77 62.67 0.63 388.82 0.77 85.75 532 659.18 20.3 106.25 659.18 738.34 733 706.69 647.63 576.05 429.73 273.41 195.35 20.3 119.01 0.77 20.3 118.15 Southwesto 20.3 0.77 113.91 Southwest 0.77 20.3 104.39 92.85 69.27 Southwesto 0.77 20.3 Southwesto 20.3 0.77 44.07 31.49 Southwest 0.77 20.3 Southwest 0.77 20.3 26 37.03 8.26 Rooflights 0 0.8 Rooflights o 1.3 Rooflights 0 0.8 54 17.15 0.63 0.63 0.63 36.26 30.48 Rooflights 0 70.28 1.3 0.8 Rooflights o 96 Rooflights 0. 1.3 111.87 57.72 0.63 0.8 Rooflights 0 150 47.63 Rooflights o 1.3 159.33 0.7 82.21 Rooflights 0. 0.8 102 0.63 80.08 193.3 0.63

TER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	0.8	x	200	x	0.63	x	0.7	=	63.5	(82)
Rooflights 0.9x	1	x	1.3	x	197.35	x	0.63	x	0.7	=	101.82	(82)
Rooflights 0.9x	1	x	0.8	x	189	x	0.63	x	0.7	=	60.01	(82)
Rooflights 0.9x	1	x	1.3	x	188.08	x	0.63	x	0.7	=	97.04	(82)
Rooflights 0.9x	1	x	0.8	x	157	x	0.63	x	0.7	=	49.85	(82)
Rooflights 0.9x	1	x	1.3	x	162.62	x	0.63	x	0.7	=	83.9	(82)
Rooflights 0.9x	1	x	0.8	x	115	x	0.63	×	0.7	=	36.51	(82)
Rooflights 0.9x	1	x	1.3	x	128.66	x	0.63	x	0.7	=	66.39	(82)
Rooflights 0.9x	1	x	0.8	x	66	x	0.63	x	0.7	=	20.96	(82)
Rooflights 0.9x	1	x	1.3	x	82.24	x	0.63	x	0.7	=	42.44	(82)
Rooflights 0.9x	1	x	0.8	x	33	x	0.63	x	0.7	=	10.48	(82)
Rooflights 0.9x	1	x	1.3	x	45.75	x	0.63	x	0.7	=	23.61	(82)
Rooflights 0.9x	1	x	0.8	x	21	x	0.63	x	0.7	=	6.67	(82)
Rooflights 0.9x	1	x	1.3	x	30.74	x	0.63	x	0.7	=	15.86	(82)
												-



Page 5 of 8

Useful gains, hmGm , W = (94)m x (84)m (95)m= 1804.9 2409.17 2922.2 3332.16 3441.38 2944.1 2143.94 2205.89 2704.08 2408.41 1892.04 1650.27
 Monthly average external temperature from Table 8

 (96)m=
 4.3
 4.9
 6.5
 8.9
 11.7
 14.6
 16.6
 16.4
 14.1
 10.6
 7.1
 4.2
 Heat loss rate for mean internal temperature, Lm , W =[(39]m x [(93)m-(96)m] [97]me 89512 869764 788538 6593.22 5084.51 4421.71 2224.63 2340.65 3665.22 5530.64 7372.51 8937.21
28496.12 Space heating requirement in kWh/m²/year 47.79 9a. Energy requirem ents – Individual heating s Space heating: Fraction of space heat from secondary/supp Fraction of space heat from main system(s) (202) = 1 - (201) = Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = Efficiency of main space heating system 1 iciency of seconda pplementary heating system, Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec e heating requirement (calculated above) 5316.85 4225.85 3692.6 2347.97 1222.48 0 0 0 0 0 2322.9 4 3945.94 5421.49 511.19 1307.47 0 0 0 0 2484.4 4220.25 5798.38 5686.47 4519.63 3949.31 2 30477.13 (211 Space heating fuel (secondary = {[(98)m x (201)]} x 100 + (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Water heating
 Output from water heater (calculated above)

 238.65
 210.06
 219.92
 196.2
 191.59
 170.21
 162.54
 179.64
 179.73
 203.5
 216.37
 232.59
 Efficiency of water I 79.8 (217)m= 89.98 89.93 89.82 89.57 88.89 79.8 79.8 79.8 79.8 89.53 89.87 90 Fuel for water b
 (219)m = [0.4]m x 100 + (217)m

 [265:22] 233.58
 244.84
 219.04
 215.55
 213.3
 203.68
 225.11
 225.22
 227.29
 240.74
 258.42
 Annual totals Space heating fuel used, main system 1 kWh/year 30477.13 Water heating fuel used 2772 Electricity for pumps, fans and electric keep-hot central heating pump: 30 (2300

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

TER WorkSheet: New dwelling design stage

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 7 of 8

TER WorkSheet: New dwelling design stage

boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting			1153.03	(232)
12a. CO2 emissions - Individual heating systems includi	ng micro-CHP			

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	6583.06 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	598.75 (264)
Space and water heating	(261) + (262) + (263) + (264) =		7181.81 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	598.42 (268)
Total CO2, kg/year	sum	n of (265)(271) =	7819.16 (272)

TER = 13.11 (273)

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

DER WorkSheet: New dwelling design stage

Assessor Name: Software Name:	Stroma ESA	2 2012		Stroma Softwar			Vorsio	n: 1 0 4 25	
sonware Namé:	Stroma FSA	2012					oad Be Gree		
Address :			openty /	iddi(33. 3	011	ICC Anna IN			
1. Overall dwelling dime	nsions:								
			Area	(m²)		Av. Height	:(m)	Volume(m ³)	_
Basement			1	7.5 (1	a) x	4	(2a) =	710	(3a)
Ground floor			1	55 <mark>(1</mark>	b) x	3.1	(2b) =	480.5	(3b)
First floor			1:	1.9 (1	c) x	2.7	(2c) =	356.13	(3c)
Second floor			1:	1.9 (1	d) x	2.6	(2d) =	342.94	 (3d)
Total floor area TFA = (1	a)+(1b)+(1c)+(1c	i)+(1e)+(1n)	5	6.3 (4)	L			-
Dwelling volume				(3a)+(3t)+(3c)+(3d)+(3	e)+(3n) =	1889.57	(5)
2. Ventilation rate:									-
	main heating	secondary heating	, ,	other		total		m ³ per hour	
Number of chimneys		+ 0] • [0	= [0	x 40 =	0	(6a)
Number of open flues	0	+ 0	i•7	0	= [0	x 20 =	0	(6b)
Number of intermittent fa	ns				ř	0	x 10 =	0	(7a)
Number of passive vents					ř	0	x 10 =	0	ц П(7ь)
Number of flueless gas fi	res				l i	0	x 40 =	0	(7c)
							1		J
							Air ch	nanges per hou	ur
Infiltration due to chimne	ys, flues and fan	s = (6a)+(6b)+(7a	i)+(7b)+(7	c) =	Г	0	+ (5) =	0	(8)
If a pressurisation test has b		intended, proceed	to (17), o	therwise cor	tinue fi	rom (9) to (16)			-
Number of storeys in the Additional infiltration	ne dwelling (ns)							0	(9)
	05 ([(9)-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p						lucuon		0	(11)
deducting areas of openir									
If suspended wooden f	loor, enter 0.2 (u	insealed) or 0.1	l (seale	d), else er	nter 0			0	(12)
If no draught lobby, en	ter 0.05, else en	ter 0						0	(13)
Percentage of windows	s and doors drau	ght stripped						0	(14)
Window infiltration).25 - [0.2 x	(14) + 1	100] =		0	(15)
Infiltration rate				8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value,	q50, expressed	in cubic metres	per ho	ur per squ	are m	netre of enve	lope area	3	(17)
If based on air permeabil	ity value, then (1	8) = [(17) + 20]+(8)	, otherwis	e (18) = (16)			0.15	(18)
Air permeability value applie		lest has been done	or a deg	ee air perm	eability	is being used			_
Number of sides sheltere	d							2	(19)
Shelter factor				20) = 1 - [0.		19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter facto	r		21) = (18) x	(20) =			0.13	(21)
									_
Infiltration rate modified f	or monthly wind	speed							

DER WorkSheet: New dwelling design stage

(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (2		<u>`</u>											
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltra	ation rate	e (allow	ina for st	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effect			rate for t	he appli	cable ca	ise							
If mechanica											ļ	0.5	(23a
If exhaust air he									o) = (23a)		ļ	0.5	(23b
If balanced with			-	-							L	73.1	(230
a) If balance						<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	÷ 100]	(24-
(24a)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		(24a
b) If balance		-	-							-			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(245
c) If whole he if (22b)m									E - (22)				
(24c)m= 0	0.5 ×	(230), (0	c) = (230	o), other	Wise (24	c) = (22t	5) m + 0	.5 × (250	0			(240
			Ľ		<u> </u>	- ·		-					(24)
d) If natural v if (22b)m									0.51				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24) or (24	c) or (24	d) in box	x (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. Heat losses	and he	at loss	paramat									_	
J. Heat lusses	s anu ne												AXk
FIEMENT	Gros				Net Ar	ea	U-valı	ue	AXU		k-value		
ELEMENT	Gros area		Openin r		Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²·K		kJ/K
ELEMENT Doors										K)			kJ/K (26)
	area				A ,i	m ²	W/m2	2K	(W/	K)			
Doors	area				A ,i 5.7	m ² x	W/m2	2K = 0.04] =	(W/	K)			(26) (27)
Doors Windows Type	area 1 2				A ,1	m ² x x ¹	W/m2 1 /[1/(1.3)+	2K 0.04] = 0.04] =	(W/I 5.7 25.09	<)			(26) (27) (27)
Doors Windows Type Windows Type	area 1 2 e 1				A ,1 5.7 20.3 53.4	m ² x x ¹ x ¹ x ¹	W/m2 1 /[1/(1.3)+ /[1/(1.3)+	2K 0.04] = 0.04] = 0.04] =	(W/I 5.7 25.09 65.99	\$ _ _ _ _ _ _ _			(26) (27) (27) (27)
Doors Windows Type Windows Type Rooflights Type	area 1 2 e 1				A ,1 5.7 20.3 53.4 0.8	m ² x x1 x1 x1 x1 x1	W/m2 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3) +	2K 0.04] = 0.04] = 0.04] =	(W/I 5.7 25.09 65.99 1.04	\[(26) (27) (27) (27)
Doors Windows Type Windows Type Rooflights Type Rooflights Type	area 1 2 e 1	(m²)			A ,1 5.7 20.3 53.4 0.8 1.3	m ² x x1 x1 x1 x1 x1	W/m2 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	2K 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 5.7 25.09 65.99 1.04 1.69				(26) (27) (27) (27) (27)
Doors Windows Type Windows Type Rooflights Type Rooflights Type Floor	area 1 2 e 1 e 2	(m²)	п		A ,1 5.7 20.3 53.4 0.8 1.3 177.5	m ² x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1	W/m2 1 /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.1	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/l 5.7 25.09 65.99 1.04 1.69 17.75 32.4				(26) (27) (27) (27) (27) (27) (28)
Doors Windows Type Windows Type Rooflights Type Rooflights Type Floor Walls Type 1	area 1 2 e 1 e 2 295.	(m²)	- π 79.4		A ,1 5.7 20.3 53.4 0.8 1.3 177.4 216 129.2	m ² x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x	W/m2 1 (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ 0.1 0.1 0.15 0.14	'K 0.04] 0.04] 0.04] 0.04] 0.04] = 0.04] = = = = = = = = =	(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03				(26) (27) (27) (27) (27) (27) (28) (29)
Doors Windows Type Windows Type Rooflights Type Rooflights Type Floor Walls Type1 Walls Type2 Walls Type3	area 1 2 e 1 e 2 295 226.	(m ²)	79.4		A ,1 5.7 20.3 53.4 0.8 1.3 177.3 216 129.2 226.4	m ² x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x	W/m2 1 (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ 0.1 0.15 0.14 0.15	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96				(26) (27) (27) (27b (27b (27b (28) (28) (29) (29) (29)
Doors Windows Type Windows Type Rooflights Type Rooflights Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1	area 1 2 e 1 e 2 295. 129.2 226. 136.	(m ²)	79.4 0 0		A, , 1 5.7 20.3 53.4 0.8 1.3 177.4 216 129.2 226.4	m ² x 1 x1 x1 x1 x1 x1 x1 x1 x1 x2 x x4 x x	W/m2 1 (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ 0.1 0.15 0.14 0.15 0.14 0.15	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96 17.42				(26) (27) (27) (27b (27b (28) (29) (29) (29) (29)
Doors Windows Type Rooflights Type Rooflights Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2	area 1 2 e 1 e 2 295. 129.1 226. 136. 18.9	4 22 4 9	79.4		A ,1 5.7 20.3 53.4 0.8 1.3 177.3 216 129.2 226.4 134 18.9	m ² x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x	W/m2 1 (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ (1/(1.3)+ 0.1 0.15 0.14 0.15	:K = :0.04] = :0.04] = 0.04] = :0.04] = <td:0.04]< td=""> = :0.04] = :0.04] = :0.04] = :0.04] = :0.04] = :0.04] = :0.04] = :0.04] =</td:0.04]<>	(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96				(26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (29) (30) (30)
Doors Windows Type Rooflights Type Rooflights Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of el	area 1 2 e 1 e 2 295. 129. 226. 136. 18.5 lements	4 22 4 1 9 0, m ²	79.4 0 2.1		A ,1 5.7 20.3 53.4 0.8 1.3 177.3 216 129.2 226.4 134 18.9 983.5	m ² x 1 x 1 x 1 x 1 x 1 x 2 x 2 x 2	W/m2 1 [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [0.1] 0.15 0.14 0.15 0.13 0.13	:K :0.04] <td>(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96 17.42 2.46</td> <td></td> <td>kJ/m²-K</td> <td></td> <td>(26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (29) (30) (30)</td>	(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96 17.42 2.46		kJ/m²-K		(26) (27) (27) (27) (27) (28) (29) (29) (29) (29) (29) (29) (30) (30)
Doors Windows Type Rooflights Type Rooflights Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2	area 1 2 e 1 e 2 295. 129.2 136. 18.5 lements roof windo	4 22 4 .1 9 ., m ² ows, use e	79.4 0 2.1 0		A ,1 5.7 20.3 53.4 0.8 1.3 177.3 216 129.2 226.4 134 18.9 983.5	m ² x 1 x 1 x 1 x 1 x 1 x 2 x 2 x 2	W/m2 1 [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [1/(1.3)+ [0.1] 0.15 0.14 0.15 0.13 0.13	:K :0.04] <td>(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96 17.42 2.46</td> <td></td> <td>kJ/m²-K</td> <td></td> <td>(26) (27) (27) (27b (27b (28) (29) (29) (29) (29)</td>	(W/I 5.7 25.09 65.99 1.04 1.69 17.75 32.4 18.03 33.96 17.42 2.46		kJ/m²-K		(26) (27) (27) (27b (27b (28) (29) (29) (29) (29)

Heat capacit Thermal mass can be used in a design asse can be used in a design asse can be used in a design asse for design asse a design asse a design asse a design asse Heat transfer (30)me 185.2 Heat transfer (30)me 0.76 Number of d (40)me 0.76 Number of d (41)me 1.7 Assumed con if TFA > 1; if of TFA = 1; i

Page 2 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 8 of 8

Page 1 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

5B PRINCE ARTHUR ROAD | HAMPSTEAD

DER WorkSheet: New dwelling design stage

((28)(30) + (32) + (32a)(32e) =	0 (34)
Indicative Value: Medium	250 (35)
e indicative values of TMP in Table 1f	
	19.2 (36)
	<u> </u>
(33) + (36) = 2	70.59 (37)
(38)m = 0.33 × (25)m x (5)	
Sep Oct Nov Dec	
163.37 169.33 173.31 177.29	(38)
(39)m = (37) + (38)m	
433.96 439.92 443.9 447.87	
Average = Sum(39):/12= 44 (40)m = (39)m + (4)	11.41 (39)
0.73 0.74 0.74 0.75	
Average = Sum(40) 1.12 /12=).74 (40)
Sep Oct Nov Dec	
30 31 30 31	(41)
kWh/year:	
	(42)
	(43)
Sep Oct Nov Dec	
115 38 120 09 124 8 129 5	
	12.78 (44)
0 kWh/month (see Tables 1b, 1c, 1d)	
134.64 156.9 171.27 185.99	
	52.38 (45)
) to (61)	
20.2 23.54 25.69 27.9	(46)
	(47)
ame vessel 150	(47)
ers) enter '0' in (47)	
1.95	(48)
	(40)
	(43)
1.05	(50)
	Indicative Value: Medium 2 e indicative values of TMP in Table if 4 (33) + (36) = 227 (38)m = 0.33 + (25)m x (5) 5 Sep Oct Nov Dec 173.21 (39)m = (37) + (38)m 447.87 Average = Sum(39), - : /12= 44 (40)m = (30)m + (4) 0.74 0.75 Average = Sum(39), - : /12= 0 Sep Oct Nov Dec 30 31 30 31 30 31 Whypest: 3.52 0 36 117.73 185.99 Total = Sum(4), - : = 14 115.38 120.09 124.8 Total = Sum(4), - : = 14 134.4 158.9 171.27 Total = Sum(4), - : = 14 134.4 158.9 171.27 Total = Sum(4), - : = 14

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 3 of 9

A3 | DER/TER Worksheets

DER WorkSheet: New dwelling design stage

Page 4 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

lot water stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	iy)					0			(51)
f community h			on 4.3											
/olume factor											0			(52)
emperature f											0			(53
Energy lost fro			, kWh/ye	ear			(47) x (51) x (52) x (53) =		0			(54
Enter (50) or		·								1.	05			(55
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			(56
cylinder contain	s dedicated	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			(57
Primary circuit	loss (an	inual) fro	om Table	3							0			(58
rimary circuit					59)m = ((58) + 36	5 × (41)	m		· · · · ·				
(modified by	factor fr	om Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)				
59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26			(59
combi loss ca	lculated.	for each	month ((61)m =	(60) ± 36	85 x (41)m							
61)m= 0		0	0	01)11-	00) + 30	0	0	0	0	0	0	1		(61
	Ŭ					-						(50)	(04)	
otal heat req		229.24		200.9	179.22	171.85	(62)m = 188.95	0.85 × ((45)m + 212.81	· /	. ,	(59)m +	(61)m	
247.96			205.22						_	225.38	241.9			(6:
olar DHW input									r contribut	ion to wate	er heating)			
add additiona				_		_	_	<u> </u>	_					
63) m = 0	0	0	0	0	0	0	Ó	0	0	0	0			(6:
Dut <mark>put fro</mark> m w	ater hea	ter		_										
	ater hea 218.46	ter 229.24	205.22	200.9	179.22	171.85	188.95	188.74	212.81	225.38	241.9			_
	_		205.22	200.9	179.22	171.85		188.74 but from w				2510	.62	(64
64)m= 247.96	218.46	229.24					Out	out from w	ater heater	(annual)	-12	_	.62	(6
64)m= 247.96 leat gains fro	218.46	229.24					Out	out from w	ater heater	(annual)	-12	_	.62	٦.
64)m= 247.96 leat gains fro	218.46 m water 96.25	229.24 heating, 102.36	kWh/m 93.53	onth 0.2 92.94	5 1 [0.85 84.88	× (45)m 83.28	Out; + (61)n 88.96	out from wa n] + 0.8 x 88.05	ater heater k [(46)m 96.9	+ (57)m 100.23	+ (59)m]	.62	٦.
64)m= 247.96 leat gains fro 55)m= 108.58 include (57)	218.46 m water 96.25 m in calc	229.24 heating, 102.36 culation o	kWh/me 93.53 of (65)m	onth 0.2 92.94 only if c	5 1 [0.85 84.88	× (45)m 83.28	Out; + (61)n 88.96	out from wa n] + 0.8 x 88.05	ater heater k [(46)m 96.9	+ (57)m 100.23	+ (59)m]	.62	٦.
64)m= 247.96 leat gains fro 65)m= 108.58 include (57) 5. Internal ga	218.46 m water 96.25 m in calc ains (see	229.24 heating, 102.36 culation of Table 5	kWh/m 93.53 of (65)m and 5a	onth 0.2 92.94 only if c	5 1 [0.85 84.88	× (45)m 83.28	Out; + (61)n 88.96	out from wa n] + 0.8 x 88.05	ater heater k [(46)m 96.9	+ (57)m 100.23	+ (59)m]	.62	٦.
4)m= 247.96 leat gains fro 55m= 108.58 include (57) 5. Internal gain letabolic gain	218.46 m water 96.25 m in calc ains (see as (Table	229.24 heating, 102.36 culation of Table 5 5), Wat	kWh/m 93.53 of (65)m and 5a ts	onth 0.2 92.94 only if c	5 ' [0.85 84.88 ylinder is	× (45)m 83.28 s in the o	Out; + (61)m 88.96 dwelling	out from wa a] + 0.8 3 88.05 or hot w	ater heater k [(46)m 96.9 vater is fr	(annual), + (57)m 100.23 rom com	+ (59)m 106.57 munity h]	.62	٦.
4)m= 247.96 leat gains fro (5)m= 108.58 include (57) 5. Internal ge letabolic gain Jan	218.46 m water 96.25 m in calc ains (see is (Table Feb	229.24 heating, 102.36 culation of Table 5 5), Wat Mar	kWh/mo 93.53 of (65)m and 5a ts Apr	onth 0.2 92.94 only if c : May	5 ⁻ [0.85 84.88 ylinder is Jun	× (45)m 83.28 s in the o	Outp + (61)m 88.96 dwelling Aug	out from wa n] + 0.8 x 88.05 or hot w Sep	eter heater ((46)m 96.9 Pater is fr Oct	(annual)+ + (57)m 100.23 om com	+ (59)m 106.57 munity h]	.62	(6
44m= 247.96 4eat gains fro 55)m= 108.58 include (57) 5. Internal gi 4etabolic gain Jan 175.86	218.46 m water 96.25 m in calc ains (see as (Table Feb 175.86	229.24 heating, 102.36 culation o Table 5 5), Wat Mar 175.86	kWh/m 93.53 of (65)m and 5a ts Apr 175.86	onth 0.23 92.94 only if c): May 175.86	5 ' [0.85 84.88 ylinder is Jun 175.86	× (45)m 83.28 s in the o Jul 175.86	Out; + (61)m 88.96 dwelling Aug 175.86	Set from washing + 0.8 > 88.05 or hot w Sep 175.86	ater heater k [(46)m 96.9 vater is fr	(annual), + (57)m 100.23 rom com	+ (59)m 106.57 munity h]	.62	(6
34)m= 247.96 feat gains fro 108.58 include (57) 108.58 5. Internal gi 108.58 Metabolic gain Jan 175.86 175.86 ighting gains 135.86	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat	229.24 heating, 102.36 culation of Table 5 5), Wat Mar 175.86 ted in Ap	kWh/mo 93.53 of (65)m and 5a ts Apr 175.86 opendix	00000000000000000000000000000000000000	5 1 [0.85 84.88 ylinder is Jun 175.86 ion L9 or	× (45)m 83.28 s in the o Jul 175.86 r L9a), a	Outp + (61)m 88.96 dwelling dwelling 175.86 Iso see	24t from wa 1 + 0.8 > 88.05 or hot w Sep 175.86 Table 5	ater heater ((46)m 96.9 ater is fr Oct 175.86	(annual) + (57)m 100.23 om com Nov 175.86	+ (59)m 106.57 munity h Dec 175.86]	.62	(6
34)m= 247.96 leat gains fro 108.58 include (57) 108.58 5. Internal ge Jan 175.86 Jan ighting gains 65.29	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat 57.99	229.24 heating, 102.36 culation of 5), Wat Mar 175.86 ted in Ap 47.16	kWh/ma 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7	00000000000000000000000000000000000000	5 1 [0.85 84.88 ylinder is Jun 175.86 ion L9 of 22.53	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35	Outp + (61)m 88.96 dwelling 4welling 175.86 Iso see 31.65	at from washing + 0.8 88.05 88.05 or hot washing Sep 175.86 Table 5 42.48 42.48	aler heater 96.9 vater is fr Oct 175.86 53.93	(annual)+ + (57)m 100.23 om com	+ (59)m 106.57 munity h]	62	(6
34)m= 247.96 leat gains fro 108.58 include (57) 108.58 5. Internal ge Jan 175.86 Jan ighting gains 65.29	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat 57.99	229.24 heating, 102.36 culation of 5), Wat Mar 175.86 ted in Ap 47.16	kWh/ma 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7	00000000000000000000000000000000000000	5 1 [0.85 84.88 ylinder is Jun 175.86 ion L9 of 22.53	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35	Outp + (61)m 88.96 dwelling 4welling 175.86 Iso see 31.65	at from washing + 0.8 88.05 88.05 or hot washing Sep 175.86 Table 5 42.48 42.48	aler heater 96.9 vater is fr Oct 175.86 53.93	(annual) + (57)m 100.23 om com Nov 175.86	+ (59)m 106.57 munity h Dec 175.86]	.62	(6
34)m= 247.96 leat gains fro 108.58 include (57) 108.58 include (57) 5. Internal ge 108.58 175.86 ighting gains 65.29 ppliances gai 36.29	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat 57.99	229.24 heating, 102.36 culation of 5), Wat Mar 175.86 ted in Ap 47.16	kWh/ma 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7	00000000000000000000000000000000000000	5 1 [0.85 84.88 ylinder is Jun 175.86 ion L9 of 22.53	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35	Outp + (61)m 88.96 dwelling 4welling 175.86 Iso see 31.65	at from washing + 0.8 88.05 88.05 or hot washing Sep 175.86 Table 5 42.48 42.48	aler heater 96.9 vater is fr Oct 175.86 53.93	(annual) + (57)m 100.23 om com Nov 175.86	+ (59)m 106.57 munity h Dec 175.86]	.62	(6 (6
4)m 247.96 leat gains fro (5)m 108.58 include (57) 5. Internal g letabolic gains (6)m 175.86 ighting gains (7)m 65.29 ppliances ga (8)m 669.12	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat 57.99 ins (calc 676.06	229.24 heating, 102.36 culation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56	kWh/m 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7 Append 621.31	00000000000000000000000000000000000000	5 ' [0.85 84.88 ylinder is Jun 175.86 ion L9 oi 22.53 uation L 530.1	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58	Out; + (61)rr 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64	aut from washing + 0.8 automodel 88.05 or hot washing 0r hot washing Sep 175.86 Table 5 42.48 o see Tal 511.13 Stat.13	Oct 175.86 53.93 ble 5 548.38	(annual), + (57)m 100.23 om com Nov 175.86 62.95	+ (59)m 106.57 munity h Dec 175.86 67.1]	.62	(6 (6
4) m 247.96 eat gains fro (5) m 108.58 include (57) 5. Internal gr letabolic gain 46 m 65.29 ppliances ga 88 m 669.12 cooking gains	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat 57.99 ins (calc 676.06	229.24 heating, 102.36 culation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56	kWh/m 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7 Append 621.31	00000000000000000000000000000000000000	5 ' [0.85 84.88 ylinder is Jun 175.86 ion L9 oi 22.53 uation L 530.1	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58	Out; + (61)rr 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64	aut from washing + 0.8 automodel 88.05 or hot washing 0r hot washing Sep 175.86 Table 5 42.48 o see Tal 511.13 Stat.13	Oct 175.86 53.93 ble 5 548.38	(annual), + (57)m 100.23 om com Nov 175.86 62.95	+ (59)m 106.57 munity h Dec 175.86 67.1]	.62) (6 (6
4)m 247.96 leat gains from the second	218.46 m water 96.25 m in calc ains (see ss (Table Feb 175.86 (calculat 57.99 ins (calc 676.06 (calculat 40.59	229.24 heating, 102.36 ulation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in A 40.59	kWh/me 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7 o Appendix 621.31 opendix 40.59	00000000000000000000000000000000000000	5 ' [0.85 84.88 ylinder is Jun 175.86 ion L9 of 22.53 uation L 530.1 ion L15	× (45)m 83.28 s in the o 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a)	Out; + (61)rr 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se	and from ward and from ward 88.05 or hot ward Sep 175.86 Table 5 42.48 see Tail 511.13 ce Table	Oct 175.86 53.93 ble 5 548.38	(annual), + (57)m 100.23 om com Nov 175.86 62.95 595.4	+ (59)m 106.57 munity h Dec 175.86 67.1 639.59]	.62	(6 (6 (6
44/11 247.96 teat gains from the second secon	218.46 m water 96.25 m in calc ains (see ss (Table Feb 175.86 (calculat 57.99 ins (calc 676.06 (calculat 40.59	229.24 heating, 102.36 ulation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in A 40.59	kWh/me 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7 o Appendix 621.31 opendix 40.59	00000000000000000000000000000000000000	5 ' [0.85 84.88 ylinder is Jun 175.86 ion L9 of 22.53 uation L 530.1 ion L15	× (45)m 83.28 s in the o 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a)	Out; + (61)rr 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se	and from ward and from ward 88.05 or hot ward Sep 175.86 Table 5 42.48 see Tail 511.13 ce Table	Oct 175.86 53.93 ble 5 548.38	(annual), + (57)m 100.23 om com Nov 175.86 62.95 595.4	+ (59)m 106.57 munity h Dec 175.86 67.1 639.59]	.62]. (6 (6 (6
4)m 247.96 leat gains fro 108.58 include (57) include (57) 5. Internal gi Jan 16)m 175.86 16jhting gains 7/m 65.29 669.12 cooking gains 9/m 40.00 40.59 umps and fa 0/m	218.46 m water 96.25 m in calc ains (see s (Table Feb 175.86 (calculat 57.99 ins (calc 676.06 (calculat 40.59 ns gains 0	229.24 heating, 102.36 culation of Table 5 5), Wat Mar 175.86 ted in Ap 47.16 ulated in 658.56 ted in A 40.59 (Table 5 0	kWh/m 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7 Appendix 621.31 opendix 40.59 o a) 0	00000000000000000000000000000000000000	5 ' [0.85 84.88 ylinder is Jun 175.86 ion L 9 or 22.53 uation L 530.1 ion L15 40.59 0	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Outp + (61)m 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64 y, also se 40.59	set from we 1 + 0.8 88.05 or hot w Sep 175.86 Table 5 42.48 o see Tal 511.13 se Table 40.59	Oct 175.86 53.93 548.38 5 40.59	(annual): + (57)m 100.23 om com Nov 175.86 62.95 595.4 40.59	+ (59)m 106.57 munity h Dec 175.86 67.1 639.59 40.59]	.62	」. (6 (6 (6
44 min 247.96 44 min 247.96 44 min 247.96 108.58 108.58 include (57) 108.58 include (57) 5.1 5. Internal gr 4 betabolic qains 3 36 min 75.86 90 ppliances ga 9 90 pm 669.12 10.59 10.59 10 mps and fa 0.59 10 mps and fa 0.59	218.46 m water 96.25 m in calc ins (see s (Table Feb 175.86 (calculat 57.99 ins (calc 676.06 (calculat 40.59 ms gains 0 aporatio	229.24 heating, 102.36 tulation of 5), Wat 175.86 ted in Ap 47.16 ulated in Ap 47.16 ulated in A 658.56 tted in A 40.59 (Table 5 0 nn (negative)	kWh/m 93.53 of (65)m and 5a ts Apr 175.86 ppendix 35.7 Appendix 40.59 5a) 0 tive valu	onth 0.29 92.94 only if c): <u>May</u> 175.86 L, equati 26.69 dix L, equati 40.59 L, equati 40.59 0 es) (Tab	5 10.85 84.88 ylinder is 175.86 ion L9 oi 22.53 uation L 530.1 ion L15 40.59 0 e 5)	× (45)m 83.28 s in the o 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Out; + (61)m 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se 40.59 0	out from work 1 + 0.8 or 88.05 or hot w Sep 175.86 Table 5 42.48 o see Tai 511.13 ce Table 40.59	Atter heate Atter heate ((46)m) 96.9 9ater is fr Oct 175.86 53.93 ble 5 548.38 5 40.59 0 0	(annual), + (57)m 100.23 om com Nov 175.86 62.95 595.4 40.59 0	+ (59)m 106.57 munity P 175.86 67.1 639.59 40.59 0]	.62] (6 (6 (6 (6
84 nic 247.96 Heat gains fro 55 include (57) 5. 55 include (57) 5. Internal gr Aetabolic gain 175.66 36jm 108.58 98jm 669.12 200king gains 59m 98jm 669.12 200king gains 60.59 90mm 40.59 90umps and fa 700m 0 0.59855 711m -140.68	218.46 m water 96.25 m in calc ins (see s (Table Feb 175.86 (calculat 57.99 ins (calc 676.06 (calculat 676.06 (calculat 676.06 (calculat 90) s (calculat 676.06 (calculat 90) s (calculat 90) 90 90 90 90 90 90 90 90 90 90 90 90 90	229.24 heating, 102.36 Called Solution Table 5 5), Wat Mar 175.86 ted in Aç 47.16 ulated in Aç 47.16 ulated in Aç 40.59 (Table 5 0 0 n (negal	kWh/m 93.53 of (65)m and 5a ts Apr 175.86 opendix 35.7 Appendix 621.31 opendix 40.59 o a) 0	00000000000000000000000000000000000000	5 ' [0.85 84.88 ylinder is Jun 175.86 ion L 9 or 22.53 uation L 530.1 ion L15 40.59 0	× (45)m 83.28 s in the o Jul 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Outp + (61)m 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64 y, also se 40.59	set from we 1 + 0.8 88.05 or hot w Sep 175.86 Table 5 42.48 o see Tal 511.13 se Table 40.59	Oct 175.86 53.93 548.38 5 40.59	(annual): + (57)m 100.23 om com Nov 175.86 62.95 595.4 40.59	+ (59)m 106.57 munity h Dec 175.86 67.1 639.59 40.59]	.62	ے۔ (6) (6) (6) (6) (7)
Heat gains fro 55/m* 108.58 include (57) 5. 5. Internal g Metabolic gain 175.86 ighting gains 67/m* 65.29 409.12 SB/m* 66.99 Cooking gains 69.12 Cooking gains 509/m* 40.59 Pumps and fa	218.46 m water 96.25 m in calc ins (see s (Table Feb 175.86 (calculat 57.99 ins (calc 676.06 (calculat 676.06 (calculat 676.06 (calculat 90) s (calculat 676.06 (calculat 90) s (calculat 90) 90 90 90 90 90 90 90 90 90 90 90 90 90	229.24 heating, 102.36 Call Call of Call of Call of Call of Call of Call of Call of Call of Call of Call of Call of Call of Call of C	kWh/m 93.53 of (65)m and 5a ts Apr 175.86 ppendix 35.7 Appendix 40.59 5a) 0 tive valu	onth 0.29 92.94 only if c): <u>May</u> 175.86 L, equati 26.69 dix L, equati 40.59 L, equati 40.59 0 es) (Tab	5 10.85 84.88 ylinder is 175.86 ion L9 oi 22.53 uation L 530.1 ion L15 40.59 0 e 5)	× (45)m 83.28 s in the o 175.86 r L9a), a 24.35 13 or L1 500.58 or L15a 40.59	Out; + (61)m 88.96 dwelling 175.86 Iso see 31.65 3a), also 493.64), also se 40.59 0	out from work 1 + 0.8 or 88.05 or hot w Sep 175.86 Table 5 42.48 o see Tai 511.13 ce Table 40.59	Atter heate Atter heate ((46)m) 96.9 9ater is fr Oct 175.86 53.93 ble 5 548.38 5 40.59 0 0	(annual), + (57)m 100.23 om com Nov 175.86 62.95 595.4 40.59 0	+ (59)m 106.57 munity P 175.86 67.1 639.59 40.59 0]	.62](64 (63 (64) (64) (64) (77) (77) (77)

DER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 956.11 953.03 919.06 862.67 801.65 746.29 712.61 720.61 751.65 808.31 873.31 925.69 6 Solar Solar gain: Orientation: Access Factor Area m² Flux Table 6a FF Table 6c Gains (W) g_ Table 6b Table 6d 1 able 6c 0.7 Description 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 (vv) 600.47 1022.81 1399.46 1734 1942.22 1928.18 1858.97 1703.82 1515.32 1513.043 710.22 Southeast 36.79 53.4 62.67 85.75 Southeast 53.4 0.77 53.4 Southeast 53.4 106.25 0.77 119.01 119.01 118.15 113.91 104.39 92.85 69.27 144.07 Southeast 0 0.77 53.4 0.77 53.4 Southeast 53.4 0.77 53.4 53.4 53.4 Southeast 0 0.77 0.77 Southeast 0.77 08.21 44.07 31.49 36.79 62.67 85.75 106.25 0.63 x 53.4 x 53.4 x 20.3 719.22 228.27 0.63 0.77 20.3 0.63 0.65 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 388.82 (532 (662.16 (733.34 (735.35 (647.63 (576.05 (273.41 (195.35 (9.1 (8.16 (0.77 20.3 20.3 20.3 119.01 118.15 113.91 0.77 20.3 20.3 Southwesto 0.77 20.3 20.3 20.3 20.3 20.3 20.3 113.91 104.39 92.85 69.27 44.07 31.49 26 37.03 54 Southwest 0.77 Southwesto 0.77 Southwest 0.77 Southwest 0.77 Southwesto 0.77 0.8 Rooflights 0 Rooflights 0 Rooflights 0 0.8 70.28 96 111.87 8.16 17.27 14.52 27.49 Rooflights 0 1.3 Rooflights 0 1.3 0.8 1.3 Rooflights 0. 150 22.68 39.15 Rooflights 0 Rooflights 0 Rooflights 0. 0.8 192 0.3 20.03 193.3 1.3 0.3

DER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	0.8	x	200	x	0.3	x	0.7	=	30.24	(82)
Rooflights 0.9x	1	x	1.3	x	197.35	x	0.3	x	0.7	=	48.49	(82)
Rooflights 0.9x	1	x	0.8	x	189	x	0.3	x	0.7	=	28.58	(82)
Rooflights 0.9x	1	x	1.3	x	188.08	x	0.3	x	0.7	=	46.21	(82)
Rooflights 0.9x	1	x	0.8	x	157	x	0.3	x	0.7	=	23.74	(82)
Rooflights 0.9x	1	x	1.3	x	162.62	x	0.3	x	0.7	=	39.95	(82)
Rooflights 0.9x	1	x	0.8	x	115	x	0.3	x	0.7	=	17.39	(82)
Rooflights 0.9x	1	x	1.3	x	128.66	x	0.3	x	0.7	=	31.61	(82)
Rooflights 0.9x	1	x	0.8	x	66	x	0.3	x	0.7	=	9.98	(82)
Rooflights 0.9x	1	x	1.3	x	82.24	x	0.3	x	0.7	=	20.21	(82)
Rooflights 0.9x	1	x	0.8	x	33	x	0.3	x	0.7	=	4.99	(82)
Rooflights 0.9x	1	x	1.3	x	45.75	x	0.3	×	0.7	=	11.24	(82)
Rooflights 0.9x	1	x	0.8	x	21	x	0.3	x	0.7	=	3.18	(82)
Rooflights 0.9x	1	x	1.3	x	30.74	x	0.3	×	0.7	=	7.55	(82)



Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 5 of 9

Page 6 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

DER WorkSheet: New dwelling design stage

of	l agine	hmGm	W = (0,	4)m x (84	()m									
n=	<u> </u>		· · ·	3263.46	<u> </u>	2433.58	1632.86	1707.33	2470.91	2383.54	1881.84	1645.61		(95)
				perature										
n=	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)
at	loss rate	e for me	an intern	al tempe	erature,	Lm,W:	=[(39)m :	x [(93)m	– (96)m]				
n=	7326.81	7023.72	6271.15	5078.28	3824.78	2496.93	1636.96	1716.09	2734.77	4308.69	5899	7248.37		(97)
				r each n		Wh/mon	th = 0.02	4 x [(97)m – (95					
n=	4113.58	3114.3	2518.44	1306.67	440.52	0	0	0	0	1432.32	2892.36	4168.45		_
								Tota	l per year	(kWh/year) = Sum(9	8),_58.12 =	19986.63	(98)
ac	e heatin	g require	ement in	kWh/m ²	/year								33.52	(99)
. S	pace co	oling rea	quiremer	nt										_
Ilcu	lated fo	r June, .	July and	August.	See Tal	ble 10b	_					_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
at	loss rate	e Lm (ca	lculated	using 25	5°C inter	rnal tem	perature	and ext	ernal ten	nperatur	e from 1	able 10)		
)m=		0	0	0	0	4041.85	3181.88	3252.77	0	0	0	0		(100)
		tor for lo	oss hm									,		
)m=		0	0	0	0	0.91	0.96	0.94	0	0	0	0		(101)
		<u> </u>	<u> </u>	(100)m x	<u> </u>	_								
)m=		0	0	0	0		3062.25	3069.69	0	0	0	0		(102)
	<u> </u>	gains ca	_	for appli	cable we	_	ř –		-					(103)
)m=	0	0	0	0	0	4284.57	4123.49	1 N N	0	0	0	0		(103)
				r montn, < 3 × (98		iweiling,	continue	ous (kvi	(n) = 0.0	24 X [(10	/3)m – (102)m]3	(41)m	
)m=	<u> </u>	0	0	0	0	450.39	789.56	600.89	0	0	0	0		
			-						Total	= Sum(104)	=	1840.84	(104)
lec	d fraction	n							f C =	cooled	area ÷ (-	4) =	1	(105)
rmi	ittency f	actor (Ta	able 10b)										-
)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Total	= Sum(104)	-	0	(106)
	<u> </u>	<u> </u>	-	month =	r`	<u> </u>	<u> </u>	_						
)m=	0	0	0	0	0	112.6	197.39	150.22	0 Total	0 - Sum(0	0	100.01	-
										= Sum(1017)	-	460.21	(107)
				(Wh/m²/y	·				• •) ÷ (4) =	_		0.77	(108)
	~ ~ ~		nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heatir					menter								7000
				econdar		mentary			(204)				0	(201)
				nain syst	. ,			(202) = 1					1	(202)
acti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
icie	ency of I	main spa	ace heat	ing syste	em 1								377.16	(206)
icie	ency of	seconda	ry/suppl	ementar	y heating	g systen	n, %						0	(208)
oli	ng Syste	em Ener	gy Effici	ency Rat	tio								4.05	(209)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
ac				alculate	/									
		<u> </u>	2518.44		440.52	0	0	0	0	1432.32	2892.36	4168.45		
	·											• • • •		

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 7 of 9

DER WorkSheet: New dwelling design stage

1090.67 8	825.72	4)] } x 1 667.73	346.45	116.8	0	0	0	0	379.76	766.87	1105.21	1	
1090.07	023.72	007.73	340.43	110.0		0		-	ar) =Sum(2			5299.21	(211)
Space heating				month					-,			3288.21	
215)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	
							Tota	l (kWh/yea	ar) =Sum(2	15), _{5,10} , 13	-	0	(215)
Vater heating													
Dutput from wate												1	
	218.46	229.24	205.22	200.9	179.22	171.85	188.95	188.74	212.81	225.38	241.9		
fficiency of wat		119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	(216)
uel for water he				119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34		(217)
219)m = (64)m													
219)m= 207.77 1	183.06	192.09	171.96	168.34	150.18	144	158.33	158.15	178.32	188.85	202.7]	
							Tota	I = Sum(2	19a) ₁₁₂ =			2103.75	(219)
pace cooling			nth.										
221)m = (107)m 221)m= 0	n+ (209	0	0	0	27.8	48.74	37.09	0	0	0	0	1	
	<u> </u>	0	Ŭ		27.0	40.74		I = Sum(2			-	113.63	(221)
nnual totals										-			
	uel use	d main	system	1					k)	Nh/year	r	kWh/yea	ar
pace heating fu			system	1					k)	Wh/year	r	5299.21	ar
Space heating fu Vater heating fu	uel used	£	system	1					k)	Wh/year	r	5299.21 2103.75	
Space heating fu Vater heating fu Space cooling fu	uel usec uel usec	d d							K)	Wh/year	r	5299.21	
pace heating fu Vater heating fu pace cooling fu	uel usec uel usec	d d			t				k)	Wh/year	r	5299.21 2103.75	
Space heating fu Vater heating fu Space cooling fu Electricity for put	uel useo uel useo imps, fa	d d ins and	electric	keep-ho		nput fror	n outside		k)	Wh/year	2190.01	5299.21 2103.75	ar (230a
Nutural totals Space heating fu Vater heating fu Space cooling fu Electricity for pui mechanical ver 'otal electricity f	uel used uel used imps, fa ntilation	d Ins and I - balan	electric l	keep-ho ract or p		nput from			k) (230g) =			5299.21 2103.75	
pace heating fu Vater heating fu ipace cooling fu ilectricity for pu mechanical ver 'otal electricity f	uel used uel used imps, fa ntilation for the a	d Ins and I - balan	electric l	keep-ho ract or p		nput from						5299.21 2103.75 113.63	 (230a
Space heating fu Vater heating fu Space cooling fu Electricity for pul mechanical ver "otal electricity f Electricity for ligh	uel used uel used imps, fa ntilation for the a hting	d Ins and I - balan above, k	electric l iced, ext kWh/yea	keep-ho ract or p r	ositive i		sum	of (230a).				5299.21 2103.75 113.63 2190.01	(230)
Space heating fu Vater heating fu Space cooling fu Electricity for pu mechanical ver 'otal electricity f	uel used uel used imps, fa ntilation for the a hting	d Ins and I - balan above, k	electric l iced, ext kWh/yea	keep-ho ract or p r	ems inclu	uding mi	sum	of (230a).	(230g) =		2190.01	5299.21 2103.75 113.63 2190.01 1153.03	(230a (231) (232)
pace heating fu Vater heating fu ipace cooling fu ilectricity for pul mechanical ver iotal electricity f ilectricity for ligh	uel used uel used imps, fa ntilation for the a hting	d Ins and I - balan above, k	electric l iced, ext kWh/yea	keep-ho ract or p r	ems inclu En	uding mi	sum	of (230a).	(230g) = Emiss	ion fac	2190.01	5299.21 2103.75 113.63 2190.01 2190.01 1153.03	(230a (231) (232)
pace heating fu Vater heating fu pace cooling fu ilectricity for pui mechanical ver iotal electricity fo ilectricity for light 12a. CO2 emis	uel used uel used imps, fa ntilation for the a hting ssions –	d ins and i - balan above, H	electric l iced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu En kW	uding mi Iergy /h/year	sum	of (230a).	(230g) = Emiss kg CO2	ion fac	2190.01	5299.21 2103.75 113.63 2190.01 1153.03 Emission kg CO2/yt	(230a (231) (232) (232)
Space heating fu Vater heating fu Space cooling fu Electricity for pui mechanical ver "otal electricity for Electricity for ligh 12a. CO2 emis Space heating (r	uel used uel used imps, fa ntilation for the a hting ssions –	d ins and i - balan above, F Individ	electric l iced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu En kW (21	uding mi lergy /h/year 1) x	sum	of (230a).	(230g) = Emiss kg CO2	ion fac 2/kWh	2190.01 tor =	5299.21 2103.75 113.63 2190.01 1153.03 Emission kg CO2/yt 2750.29	(230a (231) (232) (232) (232) (232) (232)
Space heating fu Vater heating fu Space cooling fu Electricity for pui mechanical ver "otal electricity for Electricity for ligh 12a. CO2 emis Space heating (f	uel used uel used imps, fa ntilation for the a hting ssions –	d ins and i - balan above, F Individ	electric l iced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu Ems kW (21) (21)	uding mi lergy /h/year 1) x 5) x	sum	of (230a).	(230g) = Emiss kg CO2 0.5	ion fac 2/kWh	2190.01 tor = =	5290.21 2103.75 113.63 2190.01 1153.03 Emission kg CO2/yy 2750.29 0	(230) (231) (232) (232) (232) (232) (263)
pace heating fu Vater heating fu ipace cooling fu lectricity for pui mechanical ver otal electricity for light 12a CO2 emis ipace heating (r ipace heating (r Vater heating	uel used uel used imps, fa ntilation for the a hting ssions –	d ins and a - balan above, k Individ (stem 1) ary)	electric l iced, ext kWh/yea ual heati	keep-ho ract or p r	ems incl Em kW (21 (21) (21)	uding mi ergy /h/year 1) x 5) x 9) x	sum	of (230a).	(230g) = Emiss kg CO2	ion fac 2/kWh	2190.01 tor =	5290.21 2403.75 113.63 2190.01 1153.03 Emission kg CO2/yr 2750.29 0 1091.85	(230) (231) (232) (232) (232) (232) (232) (233) (264) (264)
pace heating fu Vater heating fu pace cooling fu lectricity for pu mechanical ver otal electricity for ligit lectricity for ligit pace heating (pace heating (vater heating pace and wate	uel used uel used imps, fa ntilation for the a hting ssions –	d ins and a - balan above, k Individ (stem 1) ary)	electric l iced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu En kW (21) (21) (21) (21) (26)	uding mi lergy /h/year 1) x 5) x 9) x 1) + (262)	sum	of (230a).	(230g) = Emiss kg CO2 0.5 ⁺ 0.5 ⁺	ion fac 2/kWh 19	2190.01 tor = =	5299.21 2100.75 113.63 2190.01 1153.03 Emission kg CO2/yl 2750.29 0 1091.85 3842.14	(230) (231) (232) (232) (232) (232) (261) (263) (264) (264) (265)
pace heating fr. Vater heating fu lectricity for pur mechanical veri otal electricity for ligit lectricity for ligit lactricity for ligit lactricity for ligit lactricity for ligit pace heating (r. Vater heating pace and wate pace cooling	uel used under used imps, fa ntilation for the a hting ssions (main sy second er heatir	d ins and i - balan above, F Individ ystem 1 ary)	electric l icced, ext kWh/yea ual heati	keep-ho ract or p r	ems incluent Em kW (21) (21) (21) (26) (22)	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	sum	of (230a).	(230g) = Emiss kg CO: 0.5 0.5 0.5	ion fac 2/kWh 19	2190.01 tor = = =	5299.21 2100.75 113.63 2190.01 1153.03 Emission kg CO2/yl 2750.29 0 1091.85 3842.14 59.98	(230) (231) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (230) (230) (230) (230) (231) (231) (231) (232) (23) (23
pace heating fr. /ater heating fu lactricity for pur mechanical veri total electricity of lactricity for lactricity of lactricity for light 12a CO2 emission pace heating (: /ater heating (: /at	uel used imps, fa ntilation for the a hting ssions – risecond er heatir imps, fa	d ins and i - balan above, F Individ ystem 1 ary)	electric l icced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu Em kW (21) (21) (21) (22) (22) (22) (23)	uding mi lergy /h/year 1) x 5) x 9) x 1) + (262) 1) x 1) x	sum	of (230a).	(230g) = Emiss kg CO2 0.5 ⁺ 0.5 ⁺	ion fac 2/kWh 19	2190.01 tor = = =	5299.21 2100.75 113.63 2190.01 1153.03 Emission kg CO2/yl 2750.29 0 1091.85 3842.14	(230) (231) (231) (232) (232) (232) (232) (232) (232) (241) (263) (264) (265) (266) (267)
pace heating fr. /ater heating fu pace cooling fr. lectricity for pur mechanical ver otal electricity of lectricity for light 12a. CO2 emis pace heating (r. pace heating (r. pace heating (r. pace heating pace and wale pace cooling lectricity for light	uel used uel used imps, fa ntilation for the a ssions – 'main sy second er heatir imps, fa	d ins and i - balan above, F Individ ystem 1 ary)	electric l icced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu Em kW (21) (21) (21) (22) (22) (22) (23)	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	sum	of (230a). 264) =	(230g) = Emisss kg CO2 0.55 0.55 0.55	ion fac 2/kWh 19 19 19	2190.01 tor = = =	5299.21 2100.75 113.63 2190.01 1153.03 Emission kg CO2/yl 2750.29 0 1091.85 3842.14 59.98	(230) (231) (232) (232) (232) (232) (232) (232) (232) (232) (233) (241) (243) (245)
pace heating fu Vater heating fu ipace cooling fu dectricity for pui mechanical ver otal electricity for light ectricity for ligh 12a. CO2 emis ipace heating (f	uel used uel used imps, fa ntilation for the a ssions – 'main sy second er heatir imps, fa	d ins and i - balan above, F Individ ystem 1 ary)	electric l icced, ext kWh/yea ual heati	keep-ho ract or p r	ems inclu Em kW (21) (21) (21) (22) (22) (22) (23)	uding mi lergy /h/year 1) x 5) x 9) x 1) + (262) 1) x 1) x	sum	of (230a). 264) =	Emiss kg CO2 0.5 0.5 0.5	ion fac 2/kWh 19 19 19	2190.01 tor = = =	5299.21 2190.01 2190.01 113.63 2190.01 1153.03 Emission kg CO2/yt 2750.29 0 1091.85 3842.14 58.38 1138.62	(230) (231) (231) (232) (232) (232) (232) (232) (232) (241) (263) (264) (265) (266) (267)

Page 8 of 9

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

DRAFT

DER WorkSheet: New dwelling design stage

El rating (section 14)

TER WorkSheet: New dwelling design stage

Assessor Name: Software Name	Stroma FSAP 2012	Stroma N Software		Versio	n: 1.0.4.25	
Continuite Maine.		Property Address: 5B				
Address :		, , , , , , , , , , , , , , , , , , , ,				
1. Overall dwelling dime	ensions:					
		Area(m ²)	Av. Height(n	1)	Volume(m ³)
Basement		177.5 (1a)	x 4	(2a) =	710	(3a)
Ground floor		155 (1b)	x 3.1	(2b) =	480.5	
First floor		131.9 (1c)	x 2.7	(2c) =	356.13	
Second floor		131.9 (1d)	x 2.6	(2d) =	342.94	 (3d)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+.	(1n) 596.3 (4)				_
Dwelling volume		(3a))+(3b)+(3c)+(3d)+(3e)+	(3n) =	1889.57	(5)
2. Ventilation rate:						-
	main seco heating hea	ndary other	total		m ³ per hou	r
Number of chimneys	0 +		= 0	x 40 =	0	(6a
Number of open flues	0 +	• • •	- 0	x 20 =	0	(6b
Number of intermittent fa	ins		4	x 10 =	40	
Number of passive vents	5		0	x 10 =	0	_ [76]
Number of flueless gas f	ires		0	x 40 =	0	- (70)
				Air ch	anges per ho	ur
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40	+ (5) =	0.02	(8)
	been carried out or is intended, p	roceed to (17), otherwise contin	nue from (9) to (16)			_
Number of storeys in t	he dwelling (ns)				0	(9)
Additional infiltration			-	9)-1]x0.1 =	0	(10)
	0.25 for steel or timber fram				0	(11)
if both types of wall are p deducting areas of openi	resent, use the value correspon	ding to the greater wall area (aft	er			
	floor, enter 0.2 (unsealed)	or 0.1 (sealed), else ente	er O	1	0	7(12)
If no draught lobby, er				1	0	
• •	s and doors draught strip	bed		ł	0	
Window infiltration		0.25 - [0.2 x (14	4) + 100] =	ł	0	
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	-	0	1(16
	q50, expressed in cubic r				5	
	lity value, then (18) = [(17) +		e mere or envelop	ic aica	0.27	
	es if a pressurisation test has be		hiliby is bains used	1	0.27	
		an oono or a vegree air perifiea	owny is being baed	1	2	7(19
Number of sides shelter		(20) = 1 - [0.07	5 x (19)] =	-	2	(19)
Number of sides shelter Shelter factor		1			0.00	=
Shelter factor	ting shelter factor	$(21) = (18) \times (2)$	0) =		0.22	
	•	(21) = (18) x (2	0) =	l	0.23	(21)

Monthly a Wind Fact: (22a)m⁻¹: Adjusted ir 0: Calculated f if mecha if exhaust if bala (24b)m⁻⁰ 0: If who if (24c)m⁻⁰ 0: If (24c)m⁻⁰ 0:

Doors Windows 1 Windows 1 Rooflights Rooflights Floor Walls Type Walls Type Walls Type Roof Type Roof Type Roof Type Total area * for windows ** include the Fabric hea

Page 9 of 9

88 (274)

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 1 of 8

5B PRINCE ARTHUR ROAD | HAMPSTEAD

TER WorkSheet: New dwelling design stage

verage	wind s	speed fr	om Tabl	e 7									
5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
tor (22a	a)m = ((22)m ÷	4										
1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
infiltrati	on rate	e (allowi	ng for sh	elter an	d wind s	peed) =	= (21a) x	(22a)m					
0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27		
			rate for t	he appli	cable ca	se							
anical v											ļ	0	(23a)
							(N5)) , othe) = (23a)		ļ	0	(23b)
		1	-	5		`	m Table 4h	,			ļ	0	(23c)
				_	_			<u> </u>	· · ·		1 – (23c)	÷ 100]	
0	0	0	0	0	0	0	0	0	0	0	0		(24a)
lanced	mecha	nical ve	entilation	without	heat rec	covery (MV) (24t)m = (22	2b)m + (23b)			
0	0	0	0	0	0	0	0	0	0	0	0		(24b)
ole hou	se ext	ract ven	tilation c	or positiv	e input v	ventilati	on from o	outside					
22b)m <	: 0.5 ×	(23b), t	hen (24d	c) = (23b); otherv	vise (24	4c) = (22b	o) m + 0.	.5 × (23t)			
0	0	0	0	0	0	0	0	0	0	0	0		(24c)
							ion from 0.5 + [(2		0.51				
· -	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54		(24d)
e air ch	ange	rate - er	nter (24a) or (24b) or (24	c) or (24	4d) in bo	x (25)					
	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54		(25)
		_											
			paramete		<u> </u>								
NT	Gros area		Openin		Net Ar A,r		U-val W/m2		A X U (W/	ĸ	k-value k.l/m ² ·k		A X k kJ/K
	arca	()			5.7	 x			5.7		Ko/III I		(26)
Type 1					<u> </u>		1/[1/(1.4)+	0.041		=			(27)
					20.3				26.91	4			
Type 2					53.4		1/[1/(1.4)+		70.8	_			(27)
s Type '	1				0.8		1/[1/(1.7) +		1.36				(27b)
s Type 2	2				1.3	x	1/[1/(1.7) +	0.04] =	2.21				(27b)
					177.5	5 x	0.13	=	23.075				(28)
be1	295.4	4	79.4		216	x	0.18	=	38.88				(29)
be2	129.2	2	0		129.2	2 X	0.18	=	23.26	i F		¬ ר	(29)
be3	226.4	4	0	=	226.4	×	0.18		40.75	i F		7 F	(29)
be1 [136.	1	2.1	=	134	- ×	0.13	= - i	17.42	f i		i –	(30)
be2 [18.9			=	18.9	\dashv	0.13	╡ _╸ ╎	2.46	= 1		= =	(30)
a of eler			<u> </u>		983.5	-			2.40				(31)
			ffective with	ndow U-v=			a formule 1	/1(1/L-yak	ie)+0.041 =	is aiven in	paragraph	32	(31)
			iternal wall			2.30 0304	J		, . 0.0496	- 3	, Li ogi apri		
at loss,	W/K =	S (A x	U)				(26)(30) + (32) =			[252.59	(33)

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 2 of 8



TER WorkSheet: New dwelling design stage



Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) (54) (55) 0 Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) x (41) (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33 22.58 23.33 (56) (57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33 22.58 23.33 (58) Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m dified by factor from Table H5 if there is solar wate (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 22.51 23.26 (59) Combi loss calculated for each month (61)m = (60) + 365 × (41)m (61)m= 0 <td 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= 238.65 210.06 219.92 196.2 191.59 170.21 162.54 179.64 179.73 203.5 216.37 232.59 Optimization Direct (C) <thDirect (C)</th> Direct (C) Direct (63) rom water he 238.65 210.06 219.92 196.2 191.59 170.21 162.54 179.64 179.73 203.5 216.37 232.59 2400. onth 0.25 ' [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m= 101.13 89.52 94.91 86.32 85.49 77.68 75.83 81.51 80.84 89.45 93.02 99.12 (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= 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 175.86 ng gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 Light = 65.29 57.99 47.16 35.7 26.69 22.53 24.35 31.65 42.48 53.93 62.95 67.1 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Taure 5 (68)m= 668.12 676.06 658.56 621.31 574.29 530.1 500.58 483.64 511.13 548.38 595.4 639.59 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)me 40.59 40.59 40.59 40.59 40.59 40.59 40.59 40.59 (69) Pumps and fans gains (Table 5a = 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 (70) Losses e.g. evaporation (negative values) (Table 5) (71)m= 140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 -140.68 (71) Water heating gains (Table 5) (72)m= 133.93 133.21 127.56 119.89 114.9 107.88 101.92 109.56 112.28 120.22 129.2 133.21 (72)

Page 4 of 8

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 3 of 8

TER WorkSheet: New dwelling design stage

TER WorkSheet: New dwelling design stage

Total interna (73)m= 949.0	9 946.02	912.05	855.66	794.64	73	9.27 705.6	7	13.6	744.64	801.2	9 866.3	918.68	1	(73
6. Solar gai	ns:					_				-			1	
Solar gains are	e calculated u	using sola	r flux from	Table 6a	and a	associated eq	uation	s to co	onvert to th	ie appli	cable orientat	ion.		
Orientation:	Access Fable 6d	actor	Area m²			Flux Table 6a		т	g_ able 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	53	.4	× [36.79	x		0.63	x	0.7	=	600.47	(77
Southeast 0.9x	0.77	×	53	.4	×	62.67	×		0.63	x	0.7	=	1022.81	(77
Southeast 0.9x	0.77	x	53	.4	× [85.75	x		0.63	×	0.7	=	1399.46	(77
Southeast 0.9x	0.77	x	53	.4	× [106.25	x		0.63	x	0.7	=	1734	(77
Southeast 0.9x		x	53	.4	× [119.01	x		0.63	x	0.7	=	1942.22	(77
Southeast 0.9x	0.77	x	53	.4	× [118.15	x		0.63	x	0.7	=	1928.18	(77
Southeast 0.9x	0.77	x	53	.4	× [113.91	x		0.63	×	0.7	=	1858.97	(77
Southeast 0.9x	0.77	×	53	.4	× [104.39	×		0.63	×	0.7	=	1703.62	(77
Southeast 0.9x	L 0.11	×	53	.4	× [92.85	×		0.63	×	0.7	=	1515.32	(77
Southeast 0.9x		x	53	.4	×	69.27	×		0.63	×	0.7	=	1130.43	(77
Southeast 0.9x		×	53	.4	×	44.07	×		0.63	×	0.7	-	719.22	(77
Southeast 0.9x	0.11	×	-53	.4	×	31.49	×		0.63	×	0.7	-	513.87	(77
Southwest <mark>0.9x</mark>	_	×	20	.3	×	36.79			0.63	×	0.7	=	228.27	(79
Southwest <mark>0.9x</mark>		×	20	.3	×	62.67			0.63	×	0.7	=	388.82	(79
Southwest <mark>0.9x</mark>	0.77	×	20	.3	×	85.75			0.63	×	0.7	-	532	(79
Southwest <mark>0.9x</mark>	0.11	×	20	.3	×	106.25			0.63	×	0.7	=	659.18	(79
Southwest0.9x		×	20	.3	×	119.01			0.63	×	0.7	=	738.34	(79
Southwesto.9x	0.11	×	20	.3	×	118.15			0.63	×	0.7	=	733	(79
Southwest _{0.9x}		x	20	.3	×	113.91			0.63	×	0.7	=	706.69	(79
Southwesto.9x		x	20	.3	×	104.39			0.63	×	0.7	=	647.63	(79
Southwesto.9x		x	20	.3	×	92.85			0.63	×	0.7	=	576.05	(79
Southwesto.9x		x	20	.3	×	69.27			0.63	×	0.7	=	429.73	(79
Southwest <mark>o.9x</mark>		x	20	.3	×	44.07			0.63	×	0.7	=	273.41	(79
Southwesto.9x		×	20	.3	× [31.49			0.63	×	0.7	=	195.35	(79
Rooflights 0.9x	1	x	0.	8	×	26	×		0.63	×	0.7	=	8.26	(82
Rooflights 0.9x	<u> </u>	×	1.	3	× [37.03	_ ×		0.63	×	0.7	=	19.11	(82
Rooflights 0.9x	<u> </u>	×	0.	8	× [54	_ ×		0.63	×	0.7	=	17.15	(82
Rooflights 0.9x		×	1.	3	× [70.28	_ ×		0.63	×	0.7	=	36.26	(82
Rooflights 0.9x	1	×	0.	8	× [96	×		0.63	×	0.7	=	30.48	(82
Rooflights 0.9x	<u> </u>	×	1.	3	× [111.87	×		0.63	×	0.7	=	57.72	(82
Rooflights 0.9x	1	×	0.	8	× [150	×		0.63	×	0.7	=	47.63	(82
Rooflights 0.9x	1	x	1.	3	× [159.33	x		0.63	x	0.7	=	82.21	(82
Rooflights 0.9x	<u> </u>	x	0.	8	×[192	×		0.63	x	0.7	=	60.96	(82
Rooflights 0.9x	1	x	1.	3	хĒ	193.3	×		0.63	×	0.7	=	99.74	(82

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Solar ga (83)m= 4 Total ga (84)m= 1 7. Mean Tempe Utilisati (86)m= Mean in (87)m= Tempera (88)m= Utilisatic Mean in (90)m= 1 Mean int (92)m= 1 Apply ac (93)m= 1 8. Spac Set Ti to the utilis

Page 5 of 8

32 | Sustainability and Energy Statement

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

TER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	0.8	3	×L	200	x	0.63	x	0.7	=	63.5	(82)
Rooflights 0.9x	1	x	1.3	3	× [197.35	x	0.63	×	0.7	=	101.82	(82)
Rooflights 0.9x	1	x	0.8	3	× [189	x	0.63	×	0.7	=	60.01	(82)
Rooflights 0.9x	1	x	1.3	3	×	188.08	x	0.63	×	0.7	=	97.04	(82)
Rooflights 0.9x	1	x	0.8	3	×	157	x	0.63	×	0.7	=	49.85	(82)
Rooflights 0.9x	1	x	1.3	3	×Ē	162.62	x	0.63	×	0.7	=	83.9	(82)
Rooflights 0.9x	1	x	0.8	3	×Ē	115	x	0.63	×	0.7	=	36.51	(82)
Rooflights 0.9x	1	x	1.3	3	×Ē	128.66	x	0.63	×	0.7	=	66.39	(82)
Rooflights 0.9x	1	x	0.8	3	×Ē	66	x	0.63	×	0.7	=	20.96	(82)
Rooflights 0.9x	1	x	1.3	3	×Ē	82.24	x	0.63	×	0.7	=	42.44	(82)
Rooflights 0.9x	1	x	0.8	3	×Ē	33	x	0.63	×	0.7	=	10.48	(82)
Rooflights 0.9x	1	x	1.3	3	×Ē	45.75	x	0.63	×	0.7	=	23.61	(82)
Rooflights 0.9x	1	x	0.8	,	×Ē	21	x	0.63	×	0.7		6.67	(82)
Rooflights 0.9x	1	x	1.3	,	×Ē	30.74	x	0.63	×	0.7	-	15.86	(82)
_					_								
Solar gains in w	atts. calcula	ated	for each m	nonth			(83)m	= Sum(74)m .	(82)m				
(83)m= 856.09	1465.05 2019	.67	2523.01 28	341.26	2826	6.5 2722.71	2485	.01 2194.27	1623.	55 1026.71	731.75	1	(83)
Total gains - int	ternal and so	olar	(84)m = (7	73)m +	- (83)m , watts	-	_	_			1	
(84)m= 1805.19	2411.07 2931	.71	3378.67 36	635.9	3565	.78 3428.31	3198	.61 2938.91	2424.	35 1893.02	1650.43	1	(84)
7 Magaintan			haating									,	
7. Mean intern		_		_				-				_	
Temperature d							ole 9,	1h1 (°C)				21	(85)
Utilisation facto		for li	ving area,	h1,m	(see	Table 9a)		_					
Jan				May	Ju	n Jul							
Jan	Feb Ma	ar	Apr	May	JU	in Jui	A	ug Sep	Oc	Nov	Dec		
(86)m= 1	Feb Ma	-	_	0.97	0.8		Al 0.8	×	0c	1 Nov	Dec 1		(86)
	1 1		0.99 (0.97	0.8	9 0.74	0.8	3 0.96	_				(86)
(86)m= 1	1 1	in l	0.99 0	0.97	0.8	9 0.74 steps 3 to 7	0.8	3 0.96 able 9c)	_	1] 1	(86) (87)
(86)m= 1 Mean internal (87)m= 19.58	1 1 temperature 19.74 19.9	in 1	0.99 0 iving area 20.31 2	0.97 T1 (fo 20.62	0.8 llow 20.8	9 0.74 steps 3 to 7 36 20.96	0.8 7 in T 20.9	3 0.96 able 9c) 95 20.75	1	1	1]	
(86)m= 1 Mean internal	1 1 temperature 19.74 19.9	e in li 99 1g pe	0.99 (iving area 20.31 2 eriods in re	0.97 T1 (fo 20.62	0.8 llow 20.8	9 0.74 steps 3 to 7 36 20.96 ling from Ta	0.8 7 in T 20.9	able 9c) 5 20.75 9, Th2 (°C)	1	1 3 19.89	1]] 1	
(86)m= 1 Mean internal 1 (87)m= 19.58 Temperature 0 (88)m= 20.02	1 1 temperature 19.74 19.9 luring heatin 20.02 20.0	e in 1 99 1g pe	0.99 (iving area 20.31 2 eriods in re 20.03 2	0.97 T1 (fo 20.62 est of c 20.03	0.8 100w 20.8 dwell 20.0	9 0.74 steps 3 to 7 36 20.96 ling from Ta 04 20.04	0.8 7 in T 20.9 able 9 20.0	able 9c) 5 20.75 9, Th2 (°C)	20.3	1 3 19.89	1 19.55]]]	(87)
(86)m= 1 Mean internal 1 (87)m= 19.58 Temperature 0 (88)m= 20.02 Utilisation fact	1 1 temperature 19.74 19.9 luring heatin 20.02 20.0 or for gains 1	in l 99 1g pe 12	0.99 (iving area 20.31 2 eriods in re 20.03 2 est of dwel	0.97 T1 (fo 20.62 est of c 20.03	0.8 100w 20.8 dwell 20.0 n2,m	9 0.74 steps 3 to 7 36 20.96 ling from Ta 34 20.04 (see Table	0.8 7 in T 20.1 able 9 20.1 9a)	0.96 able 9c) 95 20.75 9, Th2 (°C) 94 20.04	1 20.3 20.0	1 3 19.89 3 20.03	1 19.55 20.03]]]	(87)
(86)m= 1 Mean internal 1 (87)m= 19.58 Temperature 0 (88)m= 20.02 Utilisation factr (89)m= 1	1 1 temperature 19.74 19.54 luring heatin 20.02 20.02 or for gains 1 1 1	in l ig pe ig pe	0.99 (iving area 20.31 2 eriods in re 20.03 2 est of dwel 0.99 (0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95	0.8 10w 20.8 dwell 20.0 n2,m 0.8	9 0.74 steps 3 to 7 36 20.96 31 ling from Ta 4 20.04 (see Table 3 0.61	0.8 7 in T 20.9 able 9 20.0 9a) 0.6	able 9c) 35 20.75 9, Th2 (°C) 04 20.04 8 0.93	1 20.3 20.0	1 3 19.89	1 19.55]]]	(87)
(86)m= 1 Mean internal (87)m= 19.58 Temperature of (88)m= 20.02 Utilisation factr (89)m= 1 Mean internal	1 1 temperature 19.74 19.5 luring heatin 20.02 20.0 or for gains 1 1 1 temperature 1 1 1	in l in l ig pe ig pe ig pe in t	0.99 (iving area 20.31 2 eriods in re 20.03 2 est of dwel 0.99 (he rest of d	0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95 dwellir	0.8 0.8 20.8 dwell 20.0 n2,m 0.8	0 0.74 steps 3 to 7 36 36 20.96 1ing from Ta 20.04 (see Table 3 3 0.61 2 (follow steepend) 3	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3	able 9c) 35 20.75 36 20.75 37 Th2 (°C) 36 0.93 8 0.93 to 7 in Tabl	1 20.3 20.0 1 e 9c)	1 3 19.89 3 20.03 1	1 19.55 20.03		(87) (88) (89)
(86)m= 1 Mean internal 1 (87)m= 19.58 Temperature 0 (88)m= 20.02 Utilisation factr (89)m= 1	1 1 temperature 19.74 19.54 luring heatin 20.02 20.02 or for gains 1 1 1	in l in l ig pe ig pe ig pe in t	0.99 (iving area 20.31 2 eriods in re 20.03 2 est of dwel 0.99 (he rest of d	0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95	0.8 10w 20.8 dwell 20.0 n2,m 0.8	0 0.74 steps 3 to 7 36 36 20.96 1ing from Ta 20.04 (see Table 3 3 0.61 2 (follow steepend) 3	0.8 7 in T 20.9 able 9 20.0 9a) 0.6	3 0.96 able 9c) 95 95 20.75 9, Th2 (°C) 04 20.04 20.04 8 0.93 to 7 in Tabl 11 01 19.8	1 20.3 20.0 1 e 9c) 19.2	1 3 19.89 3 20.03 1 18.55	1 19.55 20.03 1 18.05]]]]	(87) (88) (89) (90)
(86)m= 1 Mean internal (87)m= 19.58 Temperature of (88)m= 20.02 Utilisation factr (89)m= 1 Mean internal	1 1 temperature 19.74 19.5 luring heatin 20.02 20.0 or for gains 1 1 1 temperature 1 1 1	in l in l ig pe ig pe ig pe in t	0.99 (iving area 20.31 2 eriods in re 20.03 2 est of dwel 0.99 (he rest of d	0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95 dwellir	0.8 0.8 20.8 dwell 20.0 n2,m 0.8	0 0.74 steps 3 to 7 36 36 20.96 1ing from Ta 20.04 (see Table 3 3 0.61 2 (follow steepend) 3	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3	3 0.96 able 9c) 95 95 20.75 9, Th2 (°C) 04 20.04 20.04 8 0.93 to 7 in Tabl 11 01 19.8	1 20.3 20.0 1 e 9c) 19.2	1 3 19.89 3 20.03 1	1 19.55 20.03 1 18.05	0.13	(87) (88) (89)
(86)m= 1 Mean internal (87)m= 19.58 Temperature of (88)m= 20.02 Utilisation factr (89)m= 1 Mean internal	1 1 temperature 19.74 19.74 19.5 luring heatin 20.02 20.02 20.00 or for gains 1 1 1 1 temperature 18.32 18.32 18.6	e in l 99 ng pe 02 for n 1 in t 59	0.99 (viving area 20.31 2 20.31 2 2 eriods in re 20.03 2 est of dwel 0.99 (0.99 (0 19.16 1	0.97 T1 (fo 20.62 est of c 20.03 est of c 20.03 est of c 20.03 duelling, h 0.95 dwellir 19.61	0.8 100 20.8 20.8 20.0 20.0 20.0 20.0 20.0 20	9 0.74 steps 3 to 7 36 20.96 36 ing from Ta 34 20.04 (see Table 3 0.61 2 (follow stee) 3 20.02	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3 20.0	3 0.96 able 9c) 35 20.75 35 20.75 30 36 20.04 20.04 36 0.93 10.7 37 119.8 6	1 20.3 20.0 1 e 9c) 19.2	1 3 19.89 3 20.03 1 18.55	1 19.55 20.03 1 18.05	0.13	(87) (88) (89) (90)
(86)m= 1 Mean internal (87)m= 19.58 Temperature c (88)m= 20.02 Utilisation factr (89)m= 1 Mean internal (90)m= 18.09	1 1 temperature 19.74 19.74 19.5 luring heatin 20.02 20.02 20.00 or for gains 1 1 1 1 temperature 18.32 18.32 18.6	e in l 99 19 pe 22 for r 59 e in t 59	0.99 0 iving area 20.31 2 eriods in re 20.03 2 eriods in re 20.03 2 est of dwel 0.99 0 he rest of d 19.16 1 the whole 1 1	0.97 T1 (fo 20.62 est of c 20.03 est of c 20.03 est of c 20.03 duelling, h 0.95 dwellir 19.61	0.8 100 20.8 20.8 20.0 20.0 20.0 20.0 20.0 20	9 0.74 steps 3 to 7 36 100 from Ta 20.96 101 g from Ta 20.04 14 20.04 (see Table 3 3 0.61 22 (follow stee 33 20.02 = fLA × T1 1	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3 20.0	3 0.96 able 9c) 35 20.75 35 20.75 0.9 36 20.75 0.9 37 7 172 (°C) 38 0.93 0.93 36 7 in Table 37 19.8 f - fLA) × T2 7	1 20.3 20.0 1 e 9c) 19.2	1 3 19.89 3 20.03 1 18.55 ving area + (4	1 19.55 20.03 1 18.05	0.13	(87) (88) (89) (90)
(86)m= 1 Mean internal (87)m= (87)m= 19.58 Temperature of (88)m= 20.02 Utilisation factr (89)m= (89)m= 1 Mean internal (90)m= (80)m= 16.09	1 1 temperature 19.74 19.92 luring heatin 20.02 20.0 or for gains l 1 1 temperature 18.32 18.6 temperature 18.32 18.6 temperature 18.5 18.6	e in l 99 ng pe 02 for n e in t 99 100 100 100 100 100 100 100	0.99 0 iving area 20.31 2 eriods in re 20.03 2 eriods in re 20.03 2 est of dwel 0.99 0 he rest of d 19.16 1 the whole 19.31 1	0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95 dwellin 19.61 19.74	0.8 20.8 20.8 dwell 20.0 0.8 19.9 19.9 19.9 19.9 19.9 20.0	9 0.74 steps 3 to 7 36 16 20.96 110 from Tz 14 20.04 (see Table 3 0.61 2 (follow stee) 13 20.02 = fLA × T1 14 20.14	0.8 7 in T 20.9 20.0 9a) 0.6 20.0 9a) 20.0 + (1.2 20.0	3 0.96 able 9c) 35 20.75 3, Th2 (°C) 34 20.04 8 0.93 10 10 19.8 f - fLA) × T2 13 19.92	1 20.3 20.0 1 e 9c) 19.2 LA = Li 19.3	1 3 19.89 3 20.03 1 18.55 ving area + (4 4 18.72	1 19.55 20.03 1 18.05 4) =	0.13	(87) (88) (89) (90) (91)
(86)m= 1 Mean internal (87)m= (87)m= 19.58 Temperature c (88)m= (88)m= 20.02 Utilisation fact (89)m= (90)m= 1 Mean internal (90)m= Mean internal (92)m= Mean internal (92)m=	1 1 temperature 19.74 19.92 luring heatin 20.02 20.0 or for gains l 1 1 temperature 18.32 18.6 temperature 18.32 18.6 temperature 18.5 18.6	in 1 in 1	0.99 0 ving area 20.31 2 20.31 2 2 eriods in re 20.03 2 est of dwel 0.99 0 he rest of d 19.16 1 rthe whole 19.31 1 internal ter 1 1	0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95 dwellin 19.61 19.74	0.8 20.8 20.8 dwell 20.0 0.8 19.9 19.9 19.9 19.9 19.9 20.0	9 0.74 steps 3 to 7 36 166 20.96 101 20.04 102 20.04 103 0.61 2 (follow stee) 103 20.02 = fLA × T1 104 20.14	0.8 7 in T 20.9 20.0 9a) 0.6 20.0 9a) 20.0 + (1.2 20.0	3 0.96 able 9c) 35 20.75 3, Th2 (°C) 34 20.04 8 0.93 10 7 in Tabl 11 19.8 f - - fLA) × T2 13 19.92 where approx	1 20.3 20.0 1 e 9c) 19.2 LA = Li 19.3	1 3 19.89 3 20.03 1 18.55 ving area + (+ 4 18.72	1 19.55 20.03 1 18.05 4) =]] 	(87) (88) (89) (90) (91)
(86)m= 1 Mean internal (87)m= (87)m= 19.58 Temperature c (88)m= (88)m= 20.02 Utilisation facts (89)m= (89)m= 1 Mean internal (90)m= (90)m= 18.09 Mean internal (92)m= (92)m= 18.28 Apply adjustm Majustm	1 1 temperature 19.7 19.7 19.5 turing heatin 20.02 20.02 20.0 or for gains the 1 1 1 1 1 1 temperature 18.32 18.32 18.6 temperature 18.5 18.5 18.8 ent to the me 18.5	in 1 in 1	0.99 0 ving area 20.31 2 20.31 2 2 eriods in re 20.03 2 est of dwel 0.99 0 he rest of d 19.16 1 rthe whole 19.31 1 internal ter 1 1	0.97 T1 (fo 20.62 est of c 20.03 elling, h 0.95 dwellin 19.61 e dwell 19.74 emperation	0.8 20.8 20.8 20.0 12,m 0.8 19.9 19.9 19.9 19.9 20.0 20.0	9 0.74 steps 3 to 7 36 166 20.96 101 20.04 102 20.04 103 0.61 2 (follow stee) 103 20.02 = fLA × T1 104 20.14	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3 20.0 + (1 20.2 20.0 + (1 20.0	3 0.96 able 9c) 35 20.75 3, Th2 (°C) 34 20.04 8 0.93 10 7 in Tabl 11 19.8 f - - fLA) × T2 13 19.92 where approx	1 20.3: 20.0: 1 19.2 LA = Li 19.34	1 3 19.89 3 20.03 1 18.55 ving area + (+ 4 18.72	1 19.55 20.03 1 18.05 4) = 18.24]] 	(87) (88) (89) (90) (91) (92)
(86)min 1 Mean internal (87)min (87)min 19.58 Temperature 0; (88)min (88)min 20.02 Utilisation facti (89)min (89)min 1 Mean internal (90)min (80)min 18.00 Mean internal (90)min (82)min 18.20	1 1 11 1 111 <td< td=""><td>ean in li in l</td><td>0.99 0 iving area 20.31 2 eriods in re 20.31 2 eriods in re 20.31 2 eriods in re 20.31 2 est of dwel 0.99 0 he rest of d 19.16 1 19.31 1 internal te 19.31 1 1</td><td>0.97 T1 (fo 20.62 eest of c 20.03 dwelling, h 19.61 e dwell 19.74 e dwell 19.74</td><td>0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8</td><td>9 0.74 steps 3 to 7 7 86 20.96 ing from Ta 20.04 14 20.04 (see Table 3 3 0.61 2 (follow steps) 3 20.02 = fLA × T1 V4 20.14 from Table 14 20.14</td><td>0.8 7 in T 20.9 9a) 0.6 eps 3 20.0 + (1. 20.1 20.1 20.1 20.1 20.1 20.1 20.1 20</td><td>3 0.96 able 9c) 35 20.75 35 20.75 36 7, Th2 (°C) 34 20.04 8 0.93 10 7 in Table 10 19.8 r r - fLA) × T2 13 19.92 where approx 13 19.92 19.92 19.92</td><td>1 20.3: 20.0: 1 e 9c) 19.2 LA = Li 19.3- 19.3-</td><td>1 3 19.89 3 20.03 1 18.55 ving area + (4 4 18.72 3 4 18.72</td><td>1 19.55 20.03 1 18.05 4) = 18.24 18.24</td><td>]</td><td>(87) (88) (89) (90) (91) (92)</td></td<>	ean in li in l	0.99 0 iving area 20.31 2 eriods in re 20.31 2 eriods in re 20.31 2 eriods in re 20.31 2 est of dwel 0.99 0 he rest of d 19.16 1 19.31 1 internal te 19.31 1 1	0.97 T1 (fo 20.62 eest of c 20.03 dwelling, h 19.61 e dwell 19.74 e dwell 19.74	0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	9 0.74 steps 3 to 7 7 86 20.96 ing from Ta 20.04 14 20.04 (see Table 3 3 0.61 2 (follow steps) 3 20.02 = fLA × T1 V4 20.14 from Table 14 20.14	0.8 7 in T 20.9 9a) 0.6 eps 3 20.0 + (1. 20.1 20.1 20.1 20.1 20.1 20.1 20.1 20	3 0.96 able 9c) 35 20.75 35 20.75 36 7, Th2 (°C) 34 20.04 8 0.93 10 7 in Table 10 19.8 r r - fLA) × T2 13 19.92 where approx 13 19.92 19.92 19.92	1 20.3: 20.0: 1 e 9c) 19.2 LA = Li 19.3- 19.3-	1 3 19.89 3 20.03 1 18.55 ving area + (4 4 18.72 3 4 18.72	1 19.55 20.03 1 18.05 4) = 18.24 18.24]	(87) (88) (89) (90) (91) (92)
(80)m= 1 Mean internal (87)m= (87)m= 19.58 Temperature c (88)m= (88)m= 20.02 Utilisation fact (89)m= (90)m= 1 Mean internal (90)m= (90)m= 18.29 Apply adjustme 18.28 3. Space heati 18.28	1 1 temperature 19.4 19.74 19.5 luring heatin 20.02 20.02 20.0 or for gains to 1 1 1 temperature 18.32 18.5 18.6 18.5 18.6 ng requirem 18.5 ng requirem 18.5	e in l ing pe ing pe ing te in t in t	0.99 (0 iving area 20.31 2 eriods in re 20.03 2 est of dwel 0.99 (0 he rest of d 19.16 1 	0.97 T1 (fo 20.62 est of c 20.03 illing, h 19.61 e dwellin 19.61 e dwellin 19.74 empera 19.74	0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	9 0.74 steps 3 to 7 7 86 20.96 ing from Ta 20.04 14 20.04 (see Table 3 3 0.61 2 (follow steps) 3 20.02 = fLA × T1 V4 20.14 from Table 14 20.14	0.8 7 in T 20.9 9a) 0.6 eps 3 20.0 + (1. 20.1 20.1 20.1 20.1 20.1 20.1 20.1 20	3 0.96 able 9c) 35 20.75 35 20.75 36 7, Th2 (°C) 34 20.04 8 0.93 10 7 in Table 10 19.8 r r - fLA) × T2 13 19.92 where approx 13 19.92 19.92 19.92	1 20.3: 20.0: 1 e 9c) 19.2 LA = Li 19.3- 19.3-	1 3 19.89 3 20.03 1 18.55 ving area + (4 4 18.72 3 4 18.72	1 19.55 20.03 1 18.05 4) = 18.24 18.24]	(87) (88) (89) (90) (91) (92)
(85)min 1 Mean internal (87)min 19.58 Temperature 0; (88)min 20.02 Utilisation factr (89)min 1 Mean internal (90)min 18.09 Mean internal (92)min 18.28 3.59ace headt Set Ti to the min	1 1 temperature 19.4 19.74 19.5 luring heatin 20.02 20.02 20.0 or for gains to 1 1 1 temperature 18.32 18.5 18.6 18.5 18.6 ng requirem 18.5 ng requirem 18.5	e in t in t	0.99 0 viving area 20.31 2 20.03 2 2 eriods in re 20.03 2 est of dwel 0.99 0 0.99 0 0 he rest of d 19.16 1 1 1 1 19.31 1 1 19.31 1 1 upperature c upperature c upperature c	0.97 T1 (fo 20.62 est of c 20.03 illing, h 19.61 e dwellin 19.61 e dwellin 19.74 empera 19.74	0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	9 0.74 steps 3 to 5 20.96 ling from Ta 20.04 (see Table 3 3 0.61 2 (follow stet 3 4 20.14 from Table 2 14 20.14	0.8 7 in T 20.9 9a) 0.6 eps 3 20.0 + (1. 20.1 20.1 20.1 20.1 20.1 20.1 20.1 20	3 0.96 able 9c) 35 20.75 35 20.75 36 20.75 36 20.75 30 Th2 (°C) 36 0.93 30 30 37 7 in Tabl 11 19.8 9 - fLA) × T2 13 19.92 where approx 13 19.92 e 9b, so that 9b, so that 9b	1 20.3: 20.0: 1 e 9c) 19.2 LA = Li 19.3- 19.3-	1 3 19.89 3 20.03 1 18.55 ving area + (* 4 18.72 5 4 18.72 (76)m and	1 19.55 20.03 1 18.05 4) = 18.24 18.24]	(87) (88) (89) (90) (91) (92)
(86)min 1 Mean internal (87)min (87)min 19.58 Temperature 0 (88)min (88)min 20.02 Utilisation facti (89)min (89)min 1 Mean internal (90)min (80)min 18.09 Mean internal (90)min (82)min 18.28 Apply adjustmin (93)min Seq Ti to the mit the utilisation for the mit the uti	1 1 1 1 1 1 1 1 1 20.02 20.02 20.0 or for gains ling 1 1	ean (for))))))))))))))))))))))))))))))))))))	0.99 0 viving area 20.31 2 20.31 2 2 eriods in re 20.03 2 est of dwel 0.99 0 he rest of d 19.16 1 19.31 1 1 internal te 19.31 1 sperature c sing Table Apr	0.97 T1 (fo 20.62 esst of o 20.03 illing, h 0.95 dwellin 19.61 e dwell 19.74 e dwell 19.74 obtaine e 9a	0.8 0.8 20.8 20.6 20.0 0.2,m 0.8 0.8 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 19.9 20.0 19.9 19	9 0.74 steps 3 to 5 20.96 ling from Ta 20.04 (see Table 3 3 0.61 2 (follow stet 33 2 (follow stet 33 2 (follow stet 34 2 (follow stet 35 3 (follow stet 36 3 (follow stet 36	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3 20.0 + (1.1 20.1 20.1 20.1 Table	3 0.96 able 9c) 35 20.75 35 20.75 36 36 20.75 30 37 172 (°C) 34 20.04 8 0.93 30 37 3 10.7 in Table 36 - fLA) × T2 13 19.92 where approx 13 19.92 a 9b, so that a b a	1 20.3: 20.0: 1 19.2 19.2 19.3 19.3 19.3 19.3 19.3 19.3 19.3	1 3 19.89 3 20.03 1 18.55 ving area + (* 4 18.72 5 4 18.72 (76)m and	1 19.55 20.03 1 18.05 4) = 18.24 18.24 18.24 d re-cale]	(87) (88) (89) (90) (91) (92)
(86)m= Mean internal (87)m= 1.58 Temperature c (88)m= 20.02 Utilisation fact (90)m= 1. Mean internal (90)m= 1.22 Mean internal (90)m= 1.22 3.2 3	1 1 1 1 1 1 1 1 1 20.02 20.02 20.0 or for gains ling 1 1	ean (for))))))))))))))))))))))))))))))))))))	0.99 (ving area 20.31 2 eriods in re 20.03 2 eriods in re 20.03 2 est of dwel 0.99 (0.99 (0 he rest of d 19.16 1 19.31 1 internal te 19.31 1 1 normal terrature or using Table Apr	0.97 T1 (fo 20.62 esst of o 20.03 illing, h 0.95 dwellin 19.61 e dwell 19.74 e dwell 19.74 obtaine e 9a	0.8 0.8 20.8 20.6 20.0 0.2,m 0.8 0.8 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 20.0 19.9 19.9 20.0 19.9 19	9 0.74 steps 3 to b 20.96 ing from Ta 20.04 (see Table 3 3 0.61 2 (follow ster 13 20.02 = # LA × T1 20.14 from Table 20.14 it step 11 of it step 11 of	0.8 7 in T 20.9 able 9 20.0 9a) 0.6 eps 3 20.0 + (1.1 20.1 20.1 20.1 Table	3 0.96 able 9c) 20.75 35 20.75 36 20.75 37 172 (°C) 34 20.04 8 0.93 to 7 in Tabl 11 11 19.8 - fLA) × T2 13 13 19.92 where appr 13 19.92 e 9b, so tha 4g Sep	1 20.3: 20.0: 1 19.2 19.2 19.3 19.3 19.3 19.3 19.3 19.3 19.3	1 3 19.89 3 20.03 1 18.55 ving area + (* 4 18.72 5 4 18.72 (76)m and	1 19.55 20.03 1 18.05 4) = 18.24 18.24 18.24 d re-cale]	(87) (88) (89) (90) (91) (92)

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 6 of 8

TER WorkSheet: New dwelling design stage

Useful gains, hmGm., W = (94)m x (84)m (66)m 1804.8 2408.17 2922.2 3332.16 3441.38 2944.1 2143.94 2205.89 2704.08 2408.41 1892.04 1650.27 Monthly average external temperature from Table 8 (66)m+ 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.8 7.1 4.2 Heat loss rate for mean intermal temperature, I.m., W =(103)m x (103)m (103)m- (96)m) (97)m 8951.2 8907.64 7855.38 6593.22 5084.51 3421.71 2244.83 2340.45 3665.22 5530.64 7372.51 8937.21 Space heating requirement for each month, kWh/month = 0.024 x (197)m - (95)m) x (41)m (98)m= 5316.85 4255.85 3892.62 2347.97 1222.48 0 0 0 2322.94 3445.94 5421.40 (95) (96) (97) 28496.12 Total per year (k Space heating requirement in kWh/m²/year 47.79 9a. Energy requirements – Individual heating systems incl Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = Efficiency of main space heating system 1 93.5 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec theating requirement (calculated above) 5316.85 4225.45 3492.6 2347.97 1222.46 0 0 0 0 2322.94 3445.64 5421.49 (211) {[(98)m x (204)] } x 1 5686.47 4519.63 3949.31 2511.19 1307.47 0 0 0 0 24<mark>84.43</mark> 4220.25 5798.38 30477.13 (211) Space heating fuel (secondary) Splate International Unit (Sectional 7), NTINIARAN = ((R9) m, 2(201)) × 100 + (208) (215)me 0 <td 0 (215 Water heating Zase5 210.06 219.92 196.2 191.59 170.21 162.54 179.64 179.73 203.5 216.37 232.59 Efficiency of water heater 79.8 (217)m= 89.98 89.93 89.82 89.57 88.89 79.8 79.8 79.8 79.8 89.53 89.87 90 Fuel for water l C19/m 265.22 233.58 244.84 219.04 215.55 213.3 203.68 225.11 225.22 227.29 240.74 258.42 Annual totals Space heating fuel used, main system 1 kWh/year 30477.13 Water heating fuel used 2772 Electricity for pumps, fans and electric keep-hot central heating pump: 30 (230c)

Page 7 of 8

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

TER WorkSheet: New dwelling design stage

boiler with a fan-assisted flue Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	(230)
Electricity for lighting			1153.03 (232
, , , ,	e includie e misse CLID		1133.03
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	6583.06 (261
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	598.75 (264
Space and water heating	(261) + (262) + (263) + (264) =		7181.81 (265
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267
Electricity for lighting	(232) x	0.519 =	598.42 (268
Total CO2, kg/year		n of (265)(271) =	7819.16 (272

TER - DRAF (273)

Stroma FSAP 2012 Version: 1.0.4.25 (SAP 9.92) - http://www.stroma.com

Page 8 of 8

5B PRINCE ARTHUR ROAD | HAMPSTEAD

Appendix A4 Energy Performance Certificate (EPC).

A4 | Energy Performance Certificate (EPC)

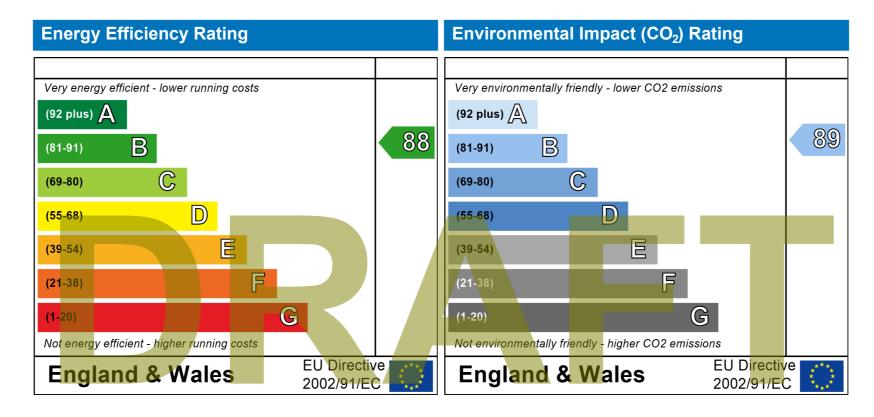
Predicted Energy Assessment



Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 27 April 2020 Stroma Certification 596.3 m²

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. 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.

5B PRINCE ARTHUR ROAD | HAMPSTEAD

Sustainability and Energy Statement | 35

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.
- A5.6 The report is provided for sole use by the client and is confidential to them and their professional advisors. No responsibility whatsoever for the contents of the report will be accepted to any person other than the client, unless otherwise agreed.
- A5.7 These terms apply in addition to the Iceni Projects Ltd "Standard Terms of Business" (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing. (In the event of a conflict between these terms and the said Standard Terms of Business, the said Standard Terms of Business shall prevail). In the absence of such a written contract, the Standard Terms of Business will apply.

5B PRINCE ARTHUR ROAD | HAMPSTEAD



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

Edinburgh: 11 Alva Street, Edinburgh, EH2 4PH Glasgow : 177 West George Street | Glasgow | G2 2LB London : Da Vinci House | 44 Saffron Hill | London | EC1N 8FH Manchester : This is The Space | 68 Quay Street | Manchester | M3 3EJ

www.iceniprojects.com | in iceni-projects | y iceniprojects | @ iceniprojects